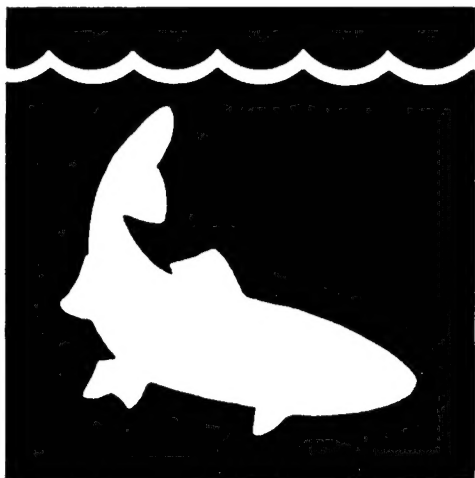




WESTERN STATE INSTREAM FLOW PROGRAMS: A COMPARATIVE ASSESSMENT

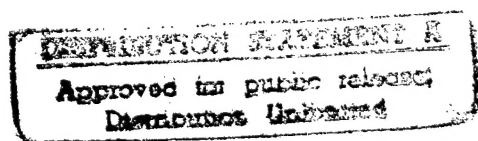
INSTREAM FLOW INFORMATION PAPER: NO. 18

BIOLOGICAL REPORT 89(2)
OCTOBER 1988



National Ecology Research Center
Fish and Wildlife Service
U.S. Department of the Interior

19970319 086



DTIC QUALITY INSPECTED 1

Biological Report 89(2)
October 1988

WESTERN STATE INSTREAM FLOW PROGRAMS:
A COMPARATIVE ASSESSMENT

Instream Flow Information Paper No. 18

by

Matthew J. McKinney
TGS Technology, Inc.
P.O. Box 9076
Fort Collins, CO 80525

and

Jonathan G. Taylor
Aquatic Systems Branch
National Ecology Research Center
U.S. Fish and Wildlife Service
2627 Redwing Road
Fort Collins, CO 80526-2899

Project Officer

Berton L. Lamb
Aquatic Systems Branch
National Ecology Research Center
U.S. Fish and Wildlife Service
2627 Redwing Road
Fort Collins, CO 80526-2899

U.S. Department of the Interior
Fish and Wildlife Service
Research and Development
Washington, DC 20240

Suggested citation:

McKinney, M.J., and J.G. Taylor. 1988. Western State instream flow programs: a comparative assessment. Instream Flow Information Paper No. 18. U.S. Fish Wildl. Serv. Biol. Rep. 89(2). 78 pp.

PREFACE

Because of water scarcity in the West, surface water diversions are necessary to serve varied agricultural, domestic, and industrial needs. These needs, often called consumptive needs, have increased as the West's population and economy have grown. State water rights laws, during their early history, were primarily viewed as means to facilitate water diversions for consumptive needs.

Recently, a countervailing concern has arisen over environmental values threatened by increasing consumptive uses. These environmental values, often called instream values, benefits, uses, or needs, consist of fish and wildlife, recreation, scenic and aesthetic resources, water quality, and related uses that are often irreparably harmed by water diversion facilities. Responding to an increasing environmental awareness, several Western States have adopted statutes specifically designed to protect instream flows.

The principal reason for the present project was to assess variation in the design and implementation of Western State, legislatively created, instream flow programs. These statutory programs are discussed at length, while non-statutory programs are treated only as a means to provide perspective. Appendix A includes a State-by-State description of the instream flow programs for the 12 Western States that implemented programs as of mid-1988; the appendix includes State programs that are not legislative. Appendix B lists instream flow legislation, jurisdiction, field methods, and criteria for 45 States. This appendix was developed from a 1986 survey of all States conducted by the Western Division of the American Fisheries Society. The data are included here to help the reader develop a comprehensive picture of the instream flow arena in the United States.

This report presents one stage in the evolution of an ongoing process, and thus should be read and used in this light. As instream flow programs evolve, some of the information contained in this report will change by either the growth of existing programs or the addition of new instream flow legislation. With these limitations in mind, the report should provide a useful summary of the variations in Western State instream flow programs as of mid-1988 and some of the issues and controversies surrounding these programs.

SUMMARY

Western water law and policy have traditionally focused on offstream water uses such as those for domestic and municipal purposes, irrigation, mining, and industry. Recently, however, several States throughout the West have adopted legislative programs that leave water in the stream, unavailable for consumptive appropriation below a specified level, for fish, wildlife, ecosystem protection, recreation, aesthetics, water quality, navigation, hydropower, and other uses. These programs threaten to change the politics and administration of Western water by not only increasing the competition for an already scarce resource, but also reserving water in the stream, unavailable for consumptive use.

The purpose of this report is to compare the design and implementation of Western State instream flow programs. The earliest instream flow legislation was adopted in Oregon in 1955, while the most recent was enacted in Utah and Wyoming in 1986. To date, nine Western States have adopted statutory instream flow programs: Alaska, Colorado, Hawaii, Idaho, Montana, Oregon, Utah, Washington, and Wyoming. Of the 13 Western States, Arizona, California, Nevada, and New Mexico have not yet passed instream flow legislation. Only New Mexico has no mechanism for protecting instream uses of water; the others have some measure of instream flow protection.

The major purpose of all legislated instream flow programs is to protect fish and wildlife, with protection of recreation close behind. Only three States recognize scenic and aesthetic values as a valid beneficial use, while six States have designated water quality as a beneficial instream use. Four States, Hawaii, Montana, Oregon, and Washington, employ a basinwide planning strategy to identify and protect instream flows, while the rest of the States use a more case-by-case approach. With the exception of the programs in Utah and Wyoming, instream flows may be protected on any river or stream throughout the other States, although Hawaii is phasing in different areas of the State over time.

In every State except Alaska and Montana, the only entity that is allowed by statute to acquire a water right for instream use is a State agency. In Montana, any political subdivision of the State, and Federal Government agencies, may acquire an instream water right, while in Alaska any public or private entity may acquire such a right. Every State except Montana employs both standard setting and incremental methods to quantify instream flow needs. Montana uses only standard setting methods. In all statutory instream flow programs, the decisionmaking process for setting instream flows consists of four basic steps: (1) instream flow quantification, (2) technical review, (3) public review and comment, and (4) agency decision. In certain programs,

the decisionmaking process also includes the other State agencies, boards and commissions, and the legislature.

In eight of the States, instream uses are granted an appropriative right with the same legal status as any other water use under the prior appropriation doctrine. Hawaiian water law is fundamentally different from that of the other Western States, stemming from the land and water rights granted by the King of Hawaii rather than the prior appropriation doctrine used throughout the continental Western States. In Colorado, Montana, and Washington, the priority date for such rights is not established until the instream flow applications have been approved, while in the other five States the priority date is established when the application is filed. Finally, the ability to monitor instream flows, once established, varies dramatically across the nine States.

The implementation of the statutory instream flow programs has been remarkable given the controversial nature of the issue. Colorado has protected over 1,000 stream reaches, while Oregon and Washington have both protected over 400 stream segments. Montana has protected 94 stream reaches, Idaho has protected 35 stream segments, and Alaska and Wyoming have each protected fewer than 10 stream segments. Hawaii has 13 streams under interim standards, all on the windward side of the Island of Oahu. Utah has yet to implement its program.

While statutory instream flow programs have been successful in appropriating unappropriated water for instream uses, most of them are not designed to protect instream values threatened by new water use permits, water rights transfers, or consumptive water users with senior rights. These concerns, however, can be addressed through a variety of innovative mechanisms, including public interest criteria and the purchase or lease of senior water rights. While many States possess these mechanisms or are considering their adoption, the challenge is to integrate them into a comprehensive instream flow program that includes the statutory programs. In addition, effective instream flow programs will have to incorporate a mechanism to balance instream flow protection with competing water demands.

CONTENTS

	<u>Page</u>
PREFACE	iii
SUMMARY	iv
ACKNOWLEDGMENTS	viii
 INTRODUCTION	 1
Selection of States	1
Legal Constraints and Institutional Strategies	1
A Brief History	3
THE DESIGN OF WESTERN STATE INSTREAM FLOW PROGRAMS	4
Purpose of the Programs	5
Alternative Strategies	5
Scope of the Programs	7
Instream Rights Holders	8
Setting Instream Flows	9
Monitoring and Enforcement	14
IMPLEMENTATION PERFORMANCE	15
DISCUSSION	17
PROSPECTS FOR THE FUTURE	18
 REFERENCES	 20
APPENDICES	
A. Western State Instream Flow Program: A State-by-State Summary ...	25
B. Survey of Instream Flow Issues in North America	45

ACKNOWLEDGMENTS

This report could not have been completed without the technical and administrative assistance of several individuals. Berton L. Lamb and the staff of the National Ecology Research Center provided not only technical guidance throughout the study, but also helped finance the study and provided a place to work. Mary Lu Harle of the Alaska Department of Natural Resources, Christopher Estes of the Alaska Department of Fish and Game, Eugene Jencsok and Dan Merriman of the Colorado Water Conservation Board, Kenneth Arment and Phillip Raiser of the Idaho Department of Water Resources, Curt Martin of the Montana Water Resources Division, Steve Brutscher and Rebecca Kreag of the Oregon Water Resources Department, Robert Morgan of Utah's Division of Water Rights, Kenneth Slattery of the Washington Department of Ecology, Frank Trelease of Wyoming's State Engineers Office, and Steven J. Shupe of Shupe and Associates all provided information on their respective State's instream flow program and reviewed a draft of the report. A special word of thanks is directed to Dr. Dudley Reiser and Thomas Wesche who, as co-chairs of the Western Division of the American Fisheries Society's Water Development and Streamflow Committee, provided us with the data for Appendix B. To all of these individuals, and to all who have not been mentioned but provided valuable information, guidance, and encouragement, thank you.

INTRODUCTION

Western water law and policy have traditionally focused on offstream water uses such as those for domestic and municipal purposes, irrigation, mining, and industry. Recently, however, several States throughout the West have adopted legislative programs that leave water in the stream, unavailable for consumptive appropriation below a specified level, for fish, wildlife, ecosystem protection, recreation, aesthetics, water quality, navigation, hydropower, and other uses. These programs threaten to change the politics and administration of Western water by not only increasing the competition for an already scarce resource, but also reserving water in the stream, unavailable for consumptive use.

The purpose of this report is to compare the design and implementation of the legislatively mandated Western State instream flow programs. First, the traditional legal constraints to instream flow protection under Western water law are reviewed, including the various institutional strategies available to protect instream flows and the history of instream flow legislation in the West. Several features of Western State instream flow programs are examined, along with the implementation performance of the programs. The paper concludes with the prospects for the future of instream flow protection in the West. Appendix A provides State-by-State summaries of instream flow programs for the 12 States west of the 100th meridian that had implemented instream flow programs as of mid-1988. Appendix B tabulates several instream flow issues for 45 States, as reported by those responding to a 1986 survey by the American Fisheries Society.

SELECTION OF STATES

Of the 13 Western States, Alaska, Colorado, Hawaii, Idaho, Montana, Oregon, Utah, Washington, and Wyoming were selected for study for the following reasons. First, these nine are all located west of the 100th meridian. Second, all nine employ some form of the prior appropriation doctrine, although Hawaii's "prior appropriation" law is unique. Third, they have all enacted legislation specifically designed to protect instream values. Arizona, California, and Nevada are not fully analyzed because, even though they protect instream flows, they have yet to enact specific laws. New Mexico is not considered because it has no instream flow program.

LEGAL CONSTRAINTS AND INSTITUTIONAL STRATEGIES

Water is perhaps the most valuable natural resource in the western United States (Western Governor's Association 1984). It not only quenches the thirst

of a growing population and gives life to essential crops, but also provides sustenance to plants, animals, and ecosystems. Water is also an important attribute of many recreational activities. Although it is one of the more abundant natural resources in the West, there is not always enough water of the right quality in the right place at the right time. This situation creates an intensely competitive atmosphere among water users.

Traditionally, the adequacy of water supply in the West has been viewed almost exclusively in terms of satisfying "offstream" water uses such as those for domestic and commercial purposes, irrigation, industry, and mining. Thus, concerns about inadequate water supplies have been translated into support for dams, reservoirs, wells, and canals to increase offstream water supplies, often at the expense of "instream" uses such as those for fish and wildlife habitat, outdoor recreation, scenic and aesthetic values, and water quality protection.

The demand for instream uses of water is rapidly increasing in many States, however, as recreation and associated instream uses make significant contributions to local, State, and regional economies (National Water Commission 1973; Adams et al. 1985; Palmer 1986). In addition, there is growing recognition of the public values in water resources and the public trust responsibility of the State to protect these values (Johnson 1980; Western States Water Council 1986). Not surprisingly, the demand for offstream uses of water is also increasing as the Western region continues to grow faster than the national average. As Western water becomes more scarce, the competition for it will intensify, and conflicts between instream and offstream uses are likely to become more and more severe, particularly in the arid and semiarid regions (Anderson 1982). If instream flows are to be protected, effective institutional mechanisms must be developed and employed.

The ability to develop and apply innovative institutional mechanisms for protecting instream flows has been difficult due to the legal and institutional framework for managing Western water. Historically, this legal and institutional framework has not recognized instream uses as valid. Under the prior appropriation doctrine, the core of Western water law and policy (Wilkinson 1985:317), the traditional requirements of a valid appropriation are an intent to apply water to a beneficial use, an actual diversion of water from a natural stream, and application of the water to a beneficial use within a reasonable time (Getches 1984:79). These latter two requirements have created problems for those who wish to protect instream values. Instream uses historically have been viewed as invalid appropriations, since they would not divert water from the stream. In addition, the values supported by instream flows have not always been considered beneficial uses in many States.

Over the years, however, State courts and legislatures have recognized the social, economic, and environmental importance of instream uses. Not only have the beneficial use and diversion requirements been refined to allow for instream uses (State Game Commission v. Red River Valley Co., 51 New Mexico 207, 182 P.2d 421, 1945; State Dept. of Parks v. Idaho Dept. of Water Administration, 96 Idaho 440, 530 P.2d 579 (1979)), but also several strategies for protecting instream flows have emerged (Tarlock 1975, 1978; Dewsnup and Jensen 1977a,b,c; Nelson et al. 1978a-k, Huffman 1980, 1983; White 1982;

Bagley et al. 1983, 1985; Metzger and Haverkamp 1984; Brandes 1985; Trembley 1987). Each of these strategies can be classified according to the institution primarily responsible for obtaining legal recognition of the flow. These institutions include: (1) legislative directives, (2) administrative actions, (3) judicial doctrines, and (4) private market strategies (Lamb and Meshorer 1983; Gray 1987).

In a general sense, almost all strategies can be classified as legislative, since enabling legislation is required to implement them. Strategies are not purely legislative, however, when administrative or judicial branches broadly interpret the mandate of the legislature. Legislative strategies that require, not just enable, instream flow protection include placing "public interest" conditions on water rights projects and transfers, directly reserving water through such programs as Wild and Scenic Rivers, and enacting statutes specifically designed for the protection of instream flows.

Administrative actions represent a variety of strategies by which the State's water rights agency conditions water rights in order to protect instream flow values that are in the public interest. In the process of reviewing applications for new water rights, transfers or modifications in water rights, or administering the State's water quality program, the administrative agency may condition the water rights so that the right holder may not use water if the stream drops below a specified level. Although many Western States use this strategy to some degree, it is the principal means for protecting instream flows in the West only in California.

The judicial system has been active in protecting instream flows either through enforcement of reasonable and beneficial use limitations on consumptive uses of water or through application of the public trust doctrine. Western State courts that have used these doctrines include California and Idaho; however, this is not the dominant strategy for protecting instream flows in any Western State.

Finally, several private market strategies are available for protecting instream flows, including private appropriations, petitioning State and Federal agencies to protect instream flows, contributing money or water rights to appropriate agencies, using nonprofit organizations to purchase instream water rights, and contractual arrangements. These strategies have yet to be employed to any significant degree.

Although several strategies for protecting instream flows have emerged, the predominant, most systematic, and potentially most effective strategy is to enact legislation specifically designed to protect instream flows.

A BRIEF HISTORY

The first legislative protection of instream values came in a 1915 Oregon prohibition of diverting water from certain streams because they fed the spectacular falls in the Columbia River Gorge (ORS 36-1). In 1955, the legislature expanded the State's authority to protect instream flows by providing for the administrative establishment of flow quantities to minimize

the impact of reduced spawning on the salmon fishery, resulting from an altered streamflow (ORS 536-300 to 310). Following the lead of Oregon, the Montana Legislature allowed the State Department of Fish, Wildlife, and Parks to acquire water rights for instream purposes on 12 "blue ribbon" trout streams by passing the "Murphy Rights" legislation in 1964, named after the principal sponsor of the bill (MCA 89-901).

Shortly after the passage of instream flow legislation in Montana, the Washington Legislature passed two statutes designed to protect instream flows in 1971 (RCW 90.22 and 90.54.020). These statutes authorized the State Department of Ecology to reserve flows from appropriation and diversion. Two years after Washington enacted instream flow legislation, in 1973, the Montana Legislature enacted a more comprehensive instream flow statute allowing the State and other political subdivisions to reserve enough water to satisfy a variety of instream uses (MCA 85-2-316). In the same year, the Colorado Legislature also enacted a statute authorizing the State Water Conservation Board to acquire water rights for instream uses (CRS 37-92-103(3)).

Following the trend of other Western States, the Idaho Legislature, in 1978, incorporated instream uses into its legal and institutional structure for administering water by establishing an instream flow program, modeled after Colorado's program (IC 42-1501). Shortly thereafter, in 1980, the Alaska Legislature amended the State's Water Use Act to allow for the reservation of water for instream flows (AS 46.15.145). The Hawaii State Legislature moved to initiate instream water use protection by passing the Hawaii Instream Use Protection Act of 1982 (Hawaii Revised Statutes, Chapter 176D). The Instream Act was superceded in 1987 with the implementation of the Hawaii State Water Code (Chapter 174C). In 1986, both Utah (UC 73-3-3) and Wyoming (WS 41-3-1001) passed legislation allowing the appropriation of water for instream uses under certain conditions. (A detailed State-by-State summary of these statutory programs is in Appendix A.)

Surprisingly, certain arid Western States that might benefit greatly from instream flow protection, including Arizona, California, New Mexico, and Nevada, have yet to enact statutes specifically designed to protect instream flows. Like the other States mentioned above, however, all but New Mexico employ a variety of administrative, and in some cases, judicial strategies to protect instream flows.

THE DESIGN OF WESTERN STATE INSTEAM FLOWS PROGRAMS

The implementation and effectiveness of Western State instream flow programs will depend on, among other variables, the design of the programs. The design is critical because it defines the purpose and objectives of the programs, specifies the strategy for achieving the objectives, outlines the scope of the programs, identifies who may acquire instream water rights, structures the context for negotiation and dispute resolution by outlining the decisionmaking process for setting instream flows, and provides for the

monitoring and enforcement of instream water rights. These features are discussed below and summarized in Table 1.

PURPOSE OF THE PROGRAMS

The general purpose of all instream flow programs is to set aside water in selected streams, unavailable for consumptive appropriation below a specified level, for the protection of instream values. However, the specific purposes or values for which instream flows may be set aside vary across States.

Alaska (AS 46.15. 145(a)), Hawaii (HRS 176D; Water Code 174C), Idaho (IC 42-1504), and Washington (RCW 90.54020(1)) allow for the broadest range of values to be legally protected, including fish and wildlife, recreation, scenic and aesthetic values, water quality, and navigation and transportation. Montana (MCA 85-2-316) allows for the protection of fish and wildlife, recreation, water quality, and future consumptive uses. Oregon (ORS 536.310) recognizes only fish and wildlife, recreation, and water quality as valid instream beneficial uses. Utah (UC 73-3-3) and Wyoming (WS 41-3-1001(b)) recognize only fish and wildlife as beneficial instream values, while Colorado's (CRS 37-92-102(3)) instream flow program is designed to protect "the natural environment to a reasonable degree."

In all nine States, the principal instream flow concern is fish and wildlife, with concern for recreation close behind. While only four States recognize scenic and aesthetic values as a valid beneficial use, six States have designated water quality as a beneficial instream use.

To date, the majority of water set aside for instream flows in all Western States has been for the purpose of maintaining fish populations. In general, there has been far less attention on the other instream values. Part of the reason for this may be an assumption that instream flows set aside for fish are sufficient to protect other instream values such as recreation and aesthetics. While this may be true in certain cases, it is far from being, of itself, a sufficient criterion for judging instream flow standards. There are cases, such as waterfalls, where instream flows are required to maintain scenic and recreational values, but where fish are not present. Another reason for the lack of attention to other instream values may be insufficient methods to quantify and justify flows necessary to protect them. Not only should there be a reevaluation of the assumption that the quantity of water set aside for fish is sufficient to protect other instream values, but also methods need to be developed or adapted to quantify and justify flows for these other instream values. Aesthetic judgment measurement techniques have been developed in landscape assessment (Taylor et al. 1987), which could readily be adapted to instream flow valuation.

ALTERNATIVE STRATEGIES

To achieve the objectives of their instream flow programs, Western States employ one of two different strategies. Alaska, Colorado, Idaho, Utah, and

Table 1. Western State instream flow programs: a comparison of institutional designs.

State	Instream flow legislation	Purpose of program ^a	Strategy	Scope	Instream rights holders	Flow quantification methods	Decision-making process ^b	Priority date	Legal status
Alaska	AS 46.15.145 (1980)	1,2,3,4,5	Case-by-case	Statewide	Any public or private entity	Standard setting	1,2,3,4,7	Filing	Appropriative right
Colorado	CRS 37-92-102 (1973)	7	Case-by-case	Statewide	Colorado Water Conservation Board	Standard setting	1,2,3,4,5	Adopted	Appropriative right
Hawaii	HRS 176D-4 (1982) State Water Code Ch 174C (1987)	1,2,3,4,5,6,7	Hydrol. Basin Planning and Stream-by-stream	Limited Statewide	Hawaii Comm'n on Water Resource Mgmt.	Standard setting	1,2,3,4		Public interest
Idaho	IC 42-1501 to 1505 (1978)	1,2,3,4,5	Case-by-case	Statewide	Idaho Water Resource Board	Standard setting	1,2,3,4,5,6	Filing	Appropriative right
Montana	MCA 85-2-316 (1973)	1,2,4,6	Basin-wide planning	Statewide	Any political subdivision of the state	Standard setting	1,2,3,4,7	Adopted	Appropriative right
Oregon	ORS 536.310 (1955)	1,2,4	Basin-wide planning	Statewide	Depts. of Env. Quality and Fish & Wildlife	Standard setting	1,2,3,4	Filing	Appropriative right
Utah	UC 73-3-3 (1986)	1	Case-by-case	Limited	Div. of Wildlife Resources			Filing	Appropriative right
Washington	RCW 90.22 (1967)	1,2,3,4,5	Basin-wide planning	Statewide	Dept. of Ecology	Standard setting	1,2,3,4,5	Adopted	Appropriative right
Wyoming	WS 41-3-1001 (1986)	1	Case-by-case	Limited	State of Wyoming	Standard setting	1,2,3,4,5,6,7	Filing	Appropriative right

^aPurpose of program: 1 = fish and wildlife; 2 = recreation; 3 = visual quality; 4 = water quality; 5 = navigation and transportation; 6 = future consumptive uses; 7 = natural environment.

^bDecisionmaking process: 1 = instream flow quantification; 2 = technical review; 3 = public review and comment; 4 = adoption; 5 = additional public and agency review; 6 = legislative review; 7 = periodic assessment.

Wyoming generally rely on a case-by-case acquisition of instream flows for individual stream reaches. That is, the implementing officials, on a relatively ad hoc basis, identify and evaluate stream reaches that may be in need of protection, depending on where the agency's attention is drawn. In most cases, there is no comprehensive effort to evaluate the instream flow needs of a given river basin or to systematically assess the trade-offs between instream and offstream uses of water. This strategy thus increases the likelihood that important instream values might not be identified before it is too late.

By contrast, Hawaii, Montana, Oregon, and Washington generally conduct basinwide evaluations of instream flow needs. This strategy allows, and in some cases requires, the implementing agency to look at an entire watershed and to assess existing and future water uses, including instream uses. This strategy also requires or allows the agency to evaluate trade-offs between instream and offstream uses. Thus, these programs not only provide a mechanism to comprehensively evaluate instream flow needs throughout an entire watershed, but also require instream flow decisions to be made in light of competing water demands.

Note that, with the exception of Alaska, the case-by-case strategy has been adopted in arid or semiarid States, where most of the watersheds are fully appropriated below the mountain headwaters. The more comprehensive basinwide planning strategy has been adopted in the relatively well-watered States of Hawaii, the Pacific Northwest, and Montana.

SCOPE OF THE PROGRAMS

While the two instream flow protection strategies vary with respect to comprehensiveness, the scope of each program, or the degree to which instream flows can be legally protected on all the streams throughout each State, is similar. In every State except Utah and Wyoming, water may be appropriated for instream flows on any stream or water body if unappropriated water exists. In Utah, instream flows may be acquired only by filing an application for a temporary or permanent change on an existing perfected water right (UC 73-3-3). Financially, the rights may be acquired only through funding provided by the legislature or by lease agreement, gift, exchange, contribution, or appurtenant water rights acquired by the acquisition of real property for other wildlife purposes.

In Wyoming, water may be appropriated for instream uses on any unappropriated stream or drainage except on waters included as a portion of the consumptive share of water allocated to the State of Wyoming under any interstate compact or U.S. Supreme Court decree (WS 41-3-1006(g-h)). Water also can be appropriated for instream flows on any stream that has seasonal streamflow surpluses.

The scope of the Utah and Wyoming programs may limit the protection of instream values in certain cases. If a stream reach with significant instream benefits does not fit under the restrictive criteria of these programs, there may be no way to protect the benefits. The comprehensive nature of the

instream flow programs in the other Western States should facilitate the protection of instream values.

INSTREAM RIGHTS HOLDERS

With the exception of Alaska, Arizona, Nevada, and Montana, the only entities that may acquire water rights for instream uses are State agencies. In Colorado, only the Colorado Water Conservation Board may acquire water rights for instream uses (SB 212, 1987), while in Idaho, only the Idaho Water Resources Board may acquire such rights (IC 42-1504). In Oregon, the Oregon Water Resources Board is the only entity allowed to acquire instream water rights (SB 140, 1987), while in Utah, only the State Division of Wildlife may acquire such rights (UC 73-3-3). In Washington, only the State Department of Ecology may acquire water rights for instream uses (RCW 90.54), while in Wyoming, only the State of Wyoming may acquire such rights (WS 41-3-1002). In Hawaii, only the State Commission on Water Resource Management may set instream flow standards (SWC 174C-71). In all of these programs, other State and Federal agencies, along with private individuals and organizations in most cases, may recommend or request that instream flows be protected on a particular stream.

In Montana, by contrast, any political subdivision of the State may appropriate water for instream uses, including municipalities, conservation districts, State agencies, and Federal agencies (MCA 85-2-316). Alaska goes one step further and allows any private individual or organization, in addition to public agencies, to acquire water rights for instream uses (AS 46.15.145(a)). Although lacking specific instream flow legislation, the States of Arizona and Nevada have allowed private applications for instream water rights for protection of fish and wildlife (Shupe 1988).

This particular feature of Western State instream flow programs raises two important issues. First, while most of the State instream flow programs allow Federal land management agencies to identify and recommend stream reaches for protection, the Federal agencies themselves are not permitted to acquire water rights for instream uses under the State programs. The Federal Government asserts claims for instream flows, both in conjunction with its reserved rights and with its general management responsibilities. However, these strategies may not be sufficient to protect all the valuable instream benefits on public lands. Not only does the reserved rights doctrine limit the purposes for which reserved rights can be claimed (United States v. New Mexico, 438 U.S. 696, 98 S.Ct. 3012), but also there remains some question as to whether the congressionally defined management purposes for the public lands are broad enough to encompass the protection of instream flows (Wilkinson and Anderson 1985:235).

While State instream flow programs provide an alternative mechanism for Federal land management agencies to protect instream flows, they potentially limit the jurisdiction of the Federal agencies over instream resources by denying them water rights per se. To date, the Federal land management agencies have been hesitant to use State instream flow programs, since they would have to rely on the State to acquire and enforce water rights for Federal

instream uses. Federal land management agencies have been content to rely on their reserved rights and management responsibilities.

Second, in every State except Alaska, Nevada, and Arizona, private individuals and organizations are not allowed to acquire water for instream uses. It is not clear why this is the case. It might be argued that instream flows provide public benefits and therefore only public entities should be allowed to acquire water rights for such uses. In addition, it might be assumed that allowing private parties to acquire instream water rights would lead to large quantities of water being tied-up by speculators or by people who simply enjoy the sound of free-flowing water running past their homes.

In response to the first argument, it is possible to imagine a rigid set of public interest criteria to ensure that private appropriations for instream flows are in the public interest. A State agency could be charged with the responsibility, for example, of determining whether such an appropriation would serve the needs of fish, wildlife, recreation, and other instream uses, and whether such use will benefit land to which the public has access. The free right to sell, transfer, or terminate private instream water rights would remain a difficult question.

Even if a State allows a private individual or organization to acquire an instream water right for a public purpose, it still leaves open the question of whether a private party should be allowed to appropriate water for an instream use that would provide private benefits. Since all Western States allow private appropriations for consumptive uses of water that provide private benefits, it is not clear what makes instream uses so different from consumptive uses that private individuals should not be allowed to acquire water to protect instream values. At the very least, it is again not difficult to imagine a set of public interest criteria to ensure that private appropriations for instream flows are reasonable and not speculative.

SETTING INSTREAM FLOWS

The decision to establish an instream flow involves two basic and distinct questions: (1) what level of flow is required to maintain or protect the desired instream value and what will be the impact of that flow level on other uses of water and related natural resources? and (2) is the quantified flow desirable in light of the costs and benefits that will result from its preservation? The first is a question of fact that must be answered by experts in the fields of hydrology, biology, and social science, relevant to measuring water use needs and environmental impacts. The second question is a political or value question that must be answered through some mechanism for making social decisions.

These two questions are answered through a decisionmaking process that is generally the same in all Western State instream flow programs and includes four basic steps: (1) instream flow quantification, (2) technical review, (3) public review and comment, and (4) agency decision. In Alaska, Colorado, Idaho, Montana, Washington, and Wyoming the decisionmaking process includes an additional review phase or veto point.

Instream Flow Quantification

The first step in the decisionmaking process of all Western State instream flow programs is to submit an application or recommendation for instream flow protection. This application or recommendation must generally identify the need for the instream flow, specify its location, and quantify the amount of water requested. This step, which provides the technical information for the decision, is typically initiated by a State or Federal agency that is cooperating with the agency responsible for administering the program. In Alaska, the process may be initiated by any private individual or organization as well.

Given the various purposes or values for which instream flows may be set aside, how are flow levels determined for each purpose or value? That is, what are the technical methods used to quantify the flow requirements for various instream uses?

To date, the development of methods to quantify instream flow needs have centered on the requirements for fish, and to a lesser degree water quality. Very little effort has been devoted to the development of methods for riparian habitat, wildlife, recreation (although see Hyra 1978), and scenic and aesthetic values. While some of these instream values may be protected by setting aside flows for fish, it is not a foregone conclusion that they are being sufficiently protected on the basis of protecting fish resources alone.

The methodologies available to quantify instream flows for fish vary in sophistication and precision, ranging from simple visual judgments about the sufficiency of historical flows, to elaborate computer models that can estimate the habitat-flow requirements of selected fish species at various life-stages. Trihey and Stalnaker (1985) identified two general types of instream flow methods: standard setting methods and incremental methods. Standard setting methods identify minimum flow standards required to protect the instream flow value in question, while the incremental methods specify trade-offs between various instream flow levels and the protection of instream flow values. The incremental methods are not designed to "set" minimum flows per se, but for "negotiating" flow regimes by quantifying flow-related trade-offs.

Standard setting methods can be further broken down into "nonfield" and "habitat retention" methods (Wesche and Rechar 1980; Loar and Sale 1981; Trihey and Stalnaker 1985; Estes and Orsborn 1986). Nonfield methods, including the Montana or Tennant method, set minimum flows on the basis of existing historical streamflow records by calculating a minimum flow requirement as a percentage of the average annual flow for the stream in question (Metzger and Haverkamp 1984). Thus, flow requirement decisions are based more on historical flow records than on field observations. While these techniques require minimal data, their speed and convenience are at the cost of accuracy and flexibility. Using the same percentage of stream flow on different watersheds ignores the importance of flow variability to individual watersheds. Although nonfield methods are not the only flow quantification methods used, the Montana or Tennant method is currently used in Alaska and has been used rarely in the past in Washington. In Hawaii, the Tennant method

has been used to set interim instream flow standards. It is not regularly used in any other Western State instream flow program.

The second type of standard setting method, habitat retention, includes a wide array of techniques that examine relationships between discharge and generalized fish habitat indices to derive flow recommendations. They are called habitat retention methods because they specify flow levels where certain desirable aquatic habitat characteristics are retained. The methods require one or more visits to the stream or river where habitat measurements are made along established cross-sectional transects. Some methods employ hydraulic simulation models [incorporating Manning's equation or stage-discharge relationships (Bovee 1982)], while others rely on repetitive measurements made at several different flows. Habitat retention methods are used exclusively in Colorado (the R2-Cross method) and Montana (the wetted perimeter method). Idaho uses the wetted perimeter method, and Oregon and Washington use the Oregon method, but both States also employ other flow quantification methods. Wyoming also employs a habitat retention model along with other flow quantification methods.

The second major category of flow quantification methods, incremental methods, produce habitat-discharge relationships for specific life stages of selected fish species. That is, they attempt to predict the actual amount of suitable fish habitat present as flow changes incrementally. While several incremental methods are available, including the "California Method" and the "WRRRI Method" (Wesche and Rechard 1980), the most widely used incremental method is the U.S. Fish and Wildlife Service's Instream Flow Incremental Methodology (IFIM). This method combines extensive data on seasonal and long-term stream flow variation, water quality, presence and habitat preferences of fish and aquatic wildlife, and geological and hydrological characteristics of streams in computer models to quantify the amount of physical habitat available along a given stream reach for any particular fish species, at any stage in its life history, at different levels and velocities of streamflow. Given its sophistication, accuracy, reliability, and flexibility, the IFIM is frequently the preferred method; however, it is costly and time consuming, requiring extensive field work to collect data and a staff proficient in surveying techniques and computer modeling. The IFIM is used, along with other methods, in Alaska, Arizona, California, Idaho, Oregon, Utah, and Washington, among the Western States. Colorado has made limited use of IFIM due to time and budget constraints, and USFWS personnel are testing IFIM for use in Hawaii. In a recent survey of instream flow issues and methods in North America (see Appendix B), over half of the 45 United States responding reported using IFIM or some subset of IFIM at sometime as their field method for determining instream flow needs. Wyoming and Washington have used PHABSIM, a subset of the IFIM, along with habitat retention models. Montana uses only standard setting methods.

Given the controversial nature of instream flow protection, it is critical to use valid methods. While incremental methods are often considered the most scientifically and legally defensible, their use is not always warranted. No flow quantification method is always superior or universally applicable. The selection of a flow quantification method should be viewed as a phased process in which both standard setting and incremental methods are considered. The

principal benefit derived from this approach is minimizing the probability of overlooking an essential component of the instream flow assessment and implementing a complex and expensive field study or modeling effort without first determining that it is necessary.

Regardless of the instream value in question, standard setting or simple incremental methods are most appropriate whenever a proposed project has relatively benign impacts, is proposed on a stream segment where instream values are limited, or is not scheduled for implementation until several years into the future (Trihey and Stalnaker 1985). However, when the proposed project threatens to radically change the biological and physical characteristics of the stream, and raises technical questions concerning the impacts on existing and anticipated instream benefits, standard setting methods are of little help. In this case, an incremental evaluation of the response of the instream values to periodic or regular changes in streamflow patterns is needed.

The first and most essential step in selecting a flow quantification methodology is identifying the purpose for which instream flows should be set aside. In general, instream flow assessments are conducted for one of the following purposes: (1) to determine the minimum flow requirement for water allocation or water quality enforcement, (2) to determine seasonal stream flow requirements necessary to maintain, restore, or enhance a particular instream use, or (3) to evaluate the effects of proposed or existing water developments and to identify opportunities for mitigation, restoration, or enhancement of affected instream resources (Trihey and Stalnaker 1985).

Once the purpose for which instream flows should be set aside is identified, the applicant must determine the minimum technical requirements of the analysis. These requirements should be based not only on the specific parameters of the instream flow value in question, but also on the likelihood of controversy over the instream flow recommendations and the degree of confidence that must be placed in the study results. The availability of data, time, money, and manpower should be considered as well.

Technical Review

The second step in the decisionmaking process of most programs is a technical review of the application by the lead agency. This technical review, which is designed to examine the justification of the need and amount of water requested, focuses on such questions as the validity of the instream flow request, the availability of water to satisfy the request, the likely impact of maintaining instream flows on other water users, and whether the proposed use is in the public interest.

Public Review And Comment

Once the technical review is complete, and any disputes resolved with respect to the availability of flows and the impacts of instream flow designations, the third step is a public review and comment period. In general, this consists of publishing a notice of intent in local newspapers,

notifying affected and interested agencies, organizations, and individuals, and holding some type of public meeting or hearing.

The purpose of this step is to identify and assess public opinion with respect to setting instream flows, which may provide an initial estimate of whether it is in the public interest to reserve water for instream uses rather than allocate it to some other competing use.

Agency Decision

The fourth and final step is for the lead agency to make a decision. In theory, this decision should be based on the technical information and public comments, and may seek to balance instream flow protection with competing water uses. Regardless of the criteria on which the agency bases its decision, such a decision represents a policy choice among competing water uses, and not just a decision on whether there are flows available to protect instream values.

While these four steps constitute the core of the decisionmaking process for all Western State instream flow programs, several States have additional phases of review or veto points, all of which provide an opportunity to incorporate values and assess the trade-offs between alternative allocations of water. In Colorado, for example, after the Colorado Water Conservation Board adopts a recommendation to protect instream flows, it must work with the Attorney General in filing for a water right in the appropriate water court. In Idaho, the Water Resources Board files an application for a water right permit with the Department of Water Resources immediately after a request or recommendation is received. The board then holds an initial review and comment period for interested and affected parties. In addition, approved instream flow applications must be submitted to the legislature by the department for final approval. [The Idaho Attorney General has issued an opinion questioning the constitutionality of this legislative veto provision (Rassier 1987).] A similar step in Washington requires flow reservations to be submitted to the State's Ecological Commission prior to final approval. If five of the seven members disapprove of the proposed rule, the agency cannot pass the rule. In Alaska and Montana, instream flow reservations must be reviewed at least once every 10 years. Finally, the administrative process for Wyoming's instream flow program not only requires several State agencies to review, evaluate, and comment on instream flow applications, but also a review of the continuation of the permit as an instream flow appropriation. These additional features make Wyoming's administrative process the most complex of all Western State instream flow programs (for a critical discussion of this process, see Reynolds 1986).

Given the central role of quantifying flows in the process of setting instream flows, there is a potential in all instream flow programs for not clearly separating technical and political issues. Although it is neither possible nor desirable to totally separate facts and values in practice, the importance of the analytical distinction is not diminished. The decisionmaking processes of most Western State instream flow programs pose the risk of confusing this distinction by focusing on the choice among competing technical explanations of the instream flows needed, rather than on the choice among

alternative allocations of water resources. As a result, the decision may be limited to whether a proposed flow level will protect a given instream value, when the real policy issue is whether the commitment to such a flow regime is preferable to the commitment of that water to some other use.

Certain instream flow programs have mechanisms that may help them avoid this potential problem. For example, in Idaho, instream flow appropriations must be submitted to the legislature for approval prior to final adoption. Likewise, in Montana and Washington, instream flow applications are submitted to politically appointed boards or commissions for final approval. When decisionmaking bodies of these types have an opportunity to participate in setting instream flows, value questions are likely to be considered along with technical questions.

MONITORING AND ENFORCEMENT

Once instream flows have been set aside, their protection depends not only on the availability of water to satisfy the flow standards, but also on the ability to monitor instream flows and to legally enforce the water rights. If instream water rights cannot be effectively monitored and legally protected, the program may be little more than symbolic.

Under all instream flow programs for the continental Western States, instream uses are granted a water right with the same legal status as any other water use under the prior appropriation doctrine. Once a water right is granted for an instream use, it is administered in its proper time of priority just like any other appropriative right. The priority date for instream flow appropriations is established at one of two times, either when a completed application is filed or when it has been approved. This date is important, since it may be years between the time the application is filed and when it is finally approved, if it ever is.

Alaska, Idaho, Oregon, Utah, and Wyoming establish the priority date for an instream water right at the time an application is filed, while Colorado, Montana, and Washington wait until the application is approved to establish the priority date. Given the lengthy amount of time it takes to review instream flow applications in certain States, particularly Montana and Washington, instream values may be threatened by allowing consumptive water users to continue acquiring water use permits while reviewing instream flow applications. Establishing instream flow priority dates when applications are filed would help eliminate this threat to instream values.

Once instream flow rights have been established and prioritized, it is critical to monitor flows. Without an effective system to monitor instream flows, the implementing agency has no way to tell when the flows are being depleted and the instream values threatened. Monitoring instream water rights is a complex administrative problem, given that instream flows are typically year-round rather than seasonal, extend for long stretches instead of being diverted at a single point, vary over time, and require the construction and monitoring of stream gauges to prevent depletion by junior users (Shupe 1986a,b).

Unfortunately, one of the greatest limitations in the administration of instream flow programs is the inability to monitor instream flows. In Colorado, the Colorado Water Conservation Board monitors instream flows by simply reviewing monthly water rights "resumes" to see if any new water use permits or water rights transfers would threaten instream flows. In Alaska, Idaho, and Montana, regulations may require instream flow appropriators to either outline a strategy in their applications for monitoring instream flows, or to install and maintain stream gauges that will help monitor instream flows. Washington has perhaps the most advanced, if not most effective, means of monitoring instream flow through a system of telemetered stream gauges.

Given that Western, continental instream water rights are under the prior appropriation system, their enforcement is not unlike the enforcement of other water rights, at least in theory. The State agency responsible for administering water rights simply adds the instream water right to the list of priorities for a particular stream, with the water right that is first in time on the top of the list, and the water right that is last in time on the bottom of the list. When voluntary compliance with the priority system breaks down, a system of "calls" is triggered. A senior water right owner, who feels that he is not getting the water to which he is entitled, will call up the water commissioner and ask him to stop diversions by any juniors until the senior's water right is satisfied. By so doing, the senior water right owner is "putting a call" on the river. To date, most instream flow programs, including those in Alaska, Idaho, Montana, Oregon, Utah, and Wyoming, have not had to make a call on a river or take other enforcement measures to protect their instream water rights. While Colorado has yet to make a call on a river to protect instream water rights, it does review monthly water rights "resumes" and has filed protests to would-be junior appropriators and transferors of water rights. Finally, Washington has implemented the most elaborate system of enforcing instream water rights by notifying consumptive water users when it appears that instream flow rights might not be satisfied, and then providing a toll-free hotline with up-to-date information on stream flow conditions and the need to reduce the amount of diversion.

IMPLEMENTATION PERFORMANCE

To what degree are instream flows being protected under the programs discussed above? What is the variation in implementation performance across States? Given the diversity in water availability, size of streams and rivers, and instream flow needs across the Western States, no common standard exists for making these determinations. As can be seen in Table 2, five basic indicators were used to assess the degree to which instream flows are being protected in eight of the Western States examined in this study: (1) the number of stream segments or reaches that have received protection (in all cases here, through the specification of minimum flow standards between two points in a river system); (2) the total number of stream miles protected, defined here as the sum of the lengths of protected stream segments; (3) the percent of total perennial stream miles that receives protection; (4) the total amount of water protected for instream uses, measured in terms of the

Table 2. A comparison of implementation performance of Western State instream flow programs.

State	Number of stream segments	Number of stream miles	Percent total stream miles	Total quantity (cfs/yr)	Percent total water use
Alaska	6	32.8	>1	94. ^a	6
Colorado	1,074	6,632.7	26	11,296.5	28
Idaho	35	224.	>1	9,131.65	6
Montana	94	2,477.9	15	30,512.5	20
Oregon	455	?	?	68,213.13	8
Utah	0	0	0	0	0
Washington	472	?	?	598,871.92 ^b	29
Wyoming	4	32.15	>1	2,170.	2

^aThese figures include both approved and pending applications.

^bThese figures are based on only 113 stream segments, including the Columbia River Basin.

average flow in cubic feet per second (cfs) (and calculated by summing the average cfs/month for each segment), and (5) the percent of total surface water use in each State devoted to instream uses [calculated by dividing the amount of water protected under a State program into the amount of total surface water use, as identified in the U.S. Geological Survey's 1985 National Water Summary (NWS)] (Moody et al. 1986). At the time of preparation of this document, Hawaii had adopted only interim standards for 13 streams in one location, Windward Oahu.

Colorado has protected as many stream segments as all the other Western States combined, with a total of 1,074 protected segments. Washington and Oregon fall into second and third place, respectively, while the other five States have managed to protect fewer than 100 segments each. Again, from Table 2, Colorado has protected the largest number of stream miles (6,632.7), followed by Montana, Idaho, Alaska, and Wyoming; Utah currently protects none, while no data were available for Oregon and Washington. Colorado also has protected the largest percent (26%), followed by Montana (15%). No data were available for Hawaii, Oregon, or Washington, and the remaining four States each protect less than 1% of their total perennial stream miles. Washington has set aside the most water for instream uses (600,000 cfs/yr in 113 of its 472 protected stream segments), and Utah has yet to set aside any flows for instream uses. In the final category listed in Table 2, Washington has

allocated 29% of its total water use to instream flow protection, followed closely by Colorado with 28%.

The measurements summarized above are relatively crude and potentially misleading if used to compare the effectiveness of various State's programs. However, the measurements do provide a general indication of the success of each State's instream flow program.

In the future, it may be useful for comparative purposes to estimate the amount of water set aside for a given instream use as a percent of the average annual streamflow. Such a measure would illustrate the variation across States with respect to how much water is being set aside for various instream uses on different size streams. It also may be useful to determine whether the instream flows set aside are the minimum, maximum, or optimum flows for a particular instream value.

DISCUSSION

The implementation performance of Western State instream flow programs is remarkable, given the historical context of Western water use. Traditionally, consumptive water uses for irrigated agriculture, mining, industry, and municipal development have competed against one another for the available supplies of water. Given the relative scarcity of water in the interior West, this competition has often been severe, and water allocation decisions have always been politically volatile.

This political and institutional context does not lend itself to the protection of instream flows. Not only do instream flow programs enlarge the competition for an already scarce resource, but also they require the reservation of water instream. Nothing could be more conflicting to the traditional practice of diverting water out of the stream for consumptive uses. In spite of this resistance inherent in the tradition and institutions of Western water law, Western States are implementing programs to protect instream flows, albeit with varying degrees of success.

As mentioned above, instream uses are incorporated into the existing water rights structure, and water rights senior in time are not generally affected by instream appropriators, since all prior users get to use water before the junior instream water right is satisfied. Persons who want to obtain a water right after the date of an instream water right may use water only when the instream flow right is satisfied. Thus, the legislative authorization for a State agency to appropriate unappropriated water for instream flows has the physical and legal advantage of protecting instream flow rights from future appropriators, as well as the political advantage of avoiding conflicts between the State and holders of existing water rights.

Although most water rights for instream uses are junior in priority, they nevertheless pose special problems for consumptive water rights holders. When water rights for consumptive uses are the subject of change proceedings (i.e.,

change of place or purpose of use, or change in the point of diversion), instream flow appropriations have legal standing to protest a transfer or change of use that may adversely affect their rights. Consequently, even junior rights for instream flows may effectively limit opportunities for economic development by constraining the marketing of water.

PROSPECTS FOR THE FUTURE

Statutory instream flow programs have been developed and are being implemented in 9 of the 13 Western States, including Alaska, Colorado, Hawaii, Idaho, Montana, Utah, Oregon, Washington, and Wyoming. Legislatively created instream flow programs have yet to be established in Arizona, California, Nevada, and New Mexico. As these latter States consider instream flow legislation, and as the other Western States consider revising their programs, the institutional strategies and implementation experiences of existing programs should provide useful information on how to design an effective instream flow program.

While statutory instream flow programs have been relatively successful in appropriating water for instream uses on streams that still have unappropriated water, they may not be sufficient to protect instream values in all situations. In many cases, instream values may be threatened by new water use permits or by the transfer of water rights. Instream values may also be threatened by consumptive water users with senior rights. Most statutory instream flow programs, as currently designed, are not capable of addressing the latter two situations. However, there are legal and institutional mechanisms available to protect instream values in these cases, and many States are in the process of incorporating such mechanisms into their instream flow programs.

In most Western States, including Alaska (AS 46.15.80), Arizona (ARS 45-143(A)), California (Johnson Rancho County Water Dist. v. State Water Rights Board, 235 Cal. App. 2d 863, 45 Cal. Rptr. 770 (1974)), Hawaii (SWC 174C-2), Idaho (IC 42-222), Montana (MCA 85-2-311 and 316), Nevada (NRS 533.370(3)), New Mexico (NMSA 72-12-1), North Dakota (NDC 61-04-06), Washington (WRC 90.54.020(a) and (g)), and Wyoming (WS 41-4-503), public interest criteria have been developed to ensure the optimum use of water. These criteria require that a new water use, and in some cases a water rights transfer, be in the public interest. Some of the factors that must be weighed under the public interest criteria of most States are: (1) benefits to the applicant resulting from the proposed appropriation, (2) effects of the economic activity resulting from the proposed appropriation, (3) effects on fish and game resources and public recreational opportunities, (4) effects on public health, (5) effects of loss of alternative uses of water, and (6) harm to other persons resulting from the proposed appropriation. These criteria can and have been used to protect instream values by conditioning new water use permits and transfers of water rights.

While instream flows may be protected by appropriating unappropriated water through statutory programs and by conditioning new water use permits and

water rights transfers through public interest criteria, they may also be threatened by consumptive water users with senior rights. One approach to resolve this issue is to invoke the public trust doctrine, as in the case of Mono Lake (National Audubon Society v. Superior Court of Alpine County, 658 P.2d 709 (1983)). However, this strategy raises a serious question about the taking of private property without compensation. An alternative approach is to transfer water rights via purchase, lease, or gift from senior consumptive water users to the State or to other entities for instream flow purposes. While this strategy may be facilitated in a variety of ways, perhaps the most promising mechanism is to increase water use efficiency and conservation and, in turn, legally allocate the salvaged flows to instream uses.

In certain circumstances, existing consumptive water rights might be sold voluntarily to a public or private entity, with the water normally depleted from the stream legally accruing to instream uses. Water use efficiency might also be encouraged or paid for by those wishing to acquire instream flows, again with the conserved water being legally appropriated by the entity financing water conservation measures. As an alternative to the purchase of existing senior water rights, agricultural water rights might be leased for instream purposes. Through this approach, an agricultural water user would receive annual lease payments and continue to operate as usual until drought occurs and water for instream purposes becomes critical. During the drought period, and in accordance with the lease agreement, the irrigator would cease his normal water use and allow the flows involved to remain instream. Even though the consumptive use would be curtailed, the irrigator would have been compensated for this loss and may be able to use the land involved for a nonirrigated crop.

As instream flow policy in the West continues to evolve, it will be important to integrate the various instream flow protection strategies into a systematic framework. However, perhaps the greatest challenge to instream flow protection in the West will be to incorporate mechanisms that allow for the balancing of competing water demands. While instream flow statutes, public interest criteria, and the public trust doctrine may be perceived as attempts to rectify an imbalance between historical water use, typically involving consumption, and environmental values, often involving non-consumptive uses, there needs to be room for optimizing the use of water resources. To this end, instream flow programs need to be developed that provide not only security to instream flow protections, but also consideration of other uses of water.

A final issue that instream flow programs will have to address in the future is whether the flows set aside actually protect the values in question. Instream flow programs may be successful in setting aside flows for instream uses, but this does not necessarily guarantee that the instream values in question are being protected.

REFERENCES

- Adams, J., et al. 1985. An environmental agenda for the future. Agenda Press, Washington, DC. 156 pp.
- Alaska Department of Natural Resources, Division of Land and Water Management. 1985. State of Alaska Instream Flow Handbook.
- Anderson, R.L. 1982. Conflicts between establishment of instream flows and other water uses on western streams. Water Resour. Bull. 18(1):61-65.
- Bagley, J.M., D.T. Larson, and L. Kapaloski. 1983. Adapting appropriation water law to accomodate equitable consideration of instream flow uses. Utah Water Research Laboratory, Utah State University, Logan. 118 pp.
- Bagley, J.M., D.T. Larson, and L. Kapaloski. 1985. Satisfying instream flow needs under western water rights. J. Water Resour. Plan. Manage. 3:171-191.
- Beeman, J.P., and K.R. Arment. 1986. Instream flows and the public trust - Idaho. Pages 31-52 in Proceedings of the 3rd Annual Western States Water Council Water Management Symposium, Los Angeles, CA.
- Bovee, K.D. 1982. A guide to stream habitat analysis using the Instream Flow Incremental Methodology. U.S. Fish Wildl. Serv. FWS/OBS-82/26. 248 pp.
- Brandes, K., ed. 1985. Opportunities to protect instream flows in Idaho, Oregon, and Washington. U.S. Fish Wildl. Serv. Biol. Rep. 85(9). 103 pp.
- Bristow, E.T., and G.A. Gould. 1986. Opportunities to protect instream flows in Montana. U.S. Fish Wildl. Serv. Biol. Rep. 86(4). 34 pp.
- Dewsnup, R., and D. Jensen. 1977a. Strategies for reserving flows for fish and wildlife. U.S. Fish Wildl. Serv. FWS/OBS-77/26. 119 pp.
- Dewsnup, R., and D. Jensen. 1977b. State laws and instream flows. U.S. Fish Wildl. Serv. FWS/OBS-77/27. 72 pp.
- Dewsnup, R., and D. Jensen. 1977c. Promising strategies for reserving instream flows. U.S. Fish Wildl. Serv. FWS/OBS-77/29. 64 pp.
- Draudt, D. [n.d.] Hawaiian Water Rights and instream flows. A working paper of the Cooperative Instream Flow Service Group, Western Energy and Land Use Team.
- Estes, C.C. 1987. Instream Flow. Alaska Department of Fish and Game, Juneau.

- Estes, C.C., and M. Harle. 1987. Alaska's instream flow program. *Instream Flow Chronicle* 4(1):1-2.
- Estes, C.C., and J.F. Orsborn. 1986. Review and analysis of methods for quantifying instream flow requirements. *Water Resources Bulletin* 22(3):389-398.
- Fassett, G.W. 1986. Wyoming's new instream flow law. Pages 109-124 in *Proceedings of the 3rd Annual Western States Water Council Water Management Symposium*, Los Angeles, CA.
- Fritz, G., et al. 1986. Public rights in water--a Montana perspective. Pages 97-107 in *Proceedings of the 3rd Annual Western States Water Council Water Management Symposium*, Los Angeles, CA.
- Getches, D.H. 1984. *Water law in a nutshell*. West Publishing, St. Paul, MN. 439 pp.
- Gray, B.E. 1987. Instream flow protection in the western states: a survey and comparison. Paper presented at the conference: *Water as a Public Resource: Emerging Rights and Obligations*. Natural Resources Law Center, University of Colorado School of Law, Boulder.
- Harle, M.L. 1986. Reserving instream flows in Alaska. Pages 169-179 in *Proceedings of the 3rd Annual Western States Water Council Water Management Symposium*, Los Angeles, CA.
- Huffman, J.L. 1980. The allocation of water to instream flows: A comparative study of policymaking and technical information in the states of Colorado, Idaho, Montana, and Washington. Office of Water Research and Technology, U.S. Department of the Interior, Washington, DC. 24 pp.
- Huffman, J.L. 1983. Instream water use: public and private alternatives. Pages 249-282 in T.L. Anderson, ed. *Water rights: scarce resource allocation, bureaucracy and the environment*. Ballinger Publishing, Cambridge, MA.
- Hyra, R. 1978. Methods of assessing instream flows for recreation. U.S. Fish Wild. Serv. FWS/OBS-78/34.
- Jenscock, E.I., and D.C. Merriman. 1986. The Colorado instream flow/natural lake level program. Pages 159-168 in *Proceedings of the 3rd Annual Western State Water Council Water Management Symposium*, Los Angeles, CA.
- Johnson, R.W. 1980. Public trust protection for stream flows and lake levels. *University of California, Davis, Law Rev.* 14:233-267.
- Jones, J. 1987. Legal review of minimum streamflow applications. *Idaho Attorney General Opinion No. 87-6*, July 31, 1987.

- Lamb, B.L., and H. Meshorer. 1983. Comparing instream flow programs: a report on current status. In Proceedings of the Conference on Advances in Irrigation and Drainage: Surviving External Pressures. A specialty conference of the American Society of Civil Engineers, Jackson, WY.
- Learn, D. 1986. Oregon's minimum perennial streamflows. Pages 125-128 in Proceedings of the 3rd Annual Western States Water Council Water Management Symposium, Los Angeles, CA.
- Loar, J.M., and M.J. Sale. 1981. Analysis of environmental issues related to small-scale hydroelectric development: V. Instream flow needs for fishery resources. Oak Ridge National Laboratory, Environmental Sciences Division. ORNL/TM-7861. 123 pp.
- Metzger, P.C., and J.A. Haverkamp. 1984. Instream flow protection: Adaptation to intensifying demands. The Conservation Foundation, Washington, DC. 33 pp.
- Moody, D.W., E.B. Chase, and D.A. Aronson. 1986. National Water Summary 1985 - Hydrological events and surface water resources. U.S. Geological Survey Water Supply Paper 2300, Washington, DC.
- Morgan, R.L. 1986. Utah's new authority for instream appropriations. Pages 197-201 in Proceedings of the 3rd Annual Western States Water Council Water Management Symposium, Los Angeles, CA.
- National Water Commission. 1973. Water policies for the future. U.S. Government Printing Office, Washington, DC. 579 pp.
- Nelson, W., G. Horak, and J. Solomon. 1978a. Instream flow strategies for Arizona. U.S. Fish Wildl. Serv. FWS/OBS-78/35. 90 pp.
- Nelson, W., G. Horak, and M. Lewis. 1978b. Instream flow strategies for California. U.S. Fish Wildl. Serv. FWS/OBS-78/36. 96 pp.
- Nelson, W., G. Horak, and M. Lewis. 1978c. Instream flow strategies for Colorado. U.S. Fish Wildl. Serv. FWS/OBS-78/37. 90 pp.
- Nelson, W., G. Horak, and J. Solomon. 1978d. Instream flow strategies for Idaho. U.S. Fish Wildl. Serv. FWS/OBS-78/38. 96 pp.
- Nelson, W., G. Horak, and J. Solomon. 1978e. Instream flow strategies for Montana. U.S. Fish Wildl. Serv. FWS/OBS-78/39. 102 pp.
- Nelson, W., G. Horak, and J. Solomon. 1978f. Instream flow strategies for Nevada. U.S. Fish Wildl. Serv. FWS/OBS-78/40. 102 pp.
- Nelson, W., G. Horak, and J. Solomon. 1978g. Instream flow strategies for New Mexico. U.S. Fish Wildl. Serv. FWS/OBS-78/41. 85 pp.
- Nelson, W., G. Horak, and S. Wilsey. 1978h. Instream flow strategies for Oregon. U.S. Fish Wildl. Serv. FWS/OBS-78/42. 113 pp.

- Nelson, W., G. Horak, and M. Lewis. 1978i. Instream flow strategies for Utah. U.S. Fish Wildl. Serv. FWS/OBS-78/45. 88 pp.
- Nelson, W., G. Horak, and S. Wilsey. 1978j. Instream flow strategies for Washington. U.S. Fish Wildl. Serv. FWS/OBS-78/46. 107 pp.
- Nelson, W., G. Horak, and J. Solomon. 1978k. Instream flow strategies for Wyoming. U.S. Fish Wildl. Serv. FWS/OBS-78/47. 88 pp.
- Orsborn, J.F., and C.H. Allman, eds. 1976. Proceedings of the Symposium and Specialty Conference on Instream Flow Needs, Boise, ID (2 Vols.) 551 pp.
- Palmer, T. 1986. Endangered rivers and the conservation movement. University of California Press, Berkeley. 316 pp.
- Paty, W.W. 1988. Memorandum to interested parties. Commission on Water Resources Management.
- Peters, J.C. 1982. Effects of river and streamflow alteration on fishery resources. Fisheries 7(2):20-22.
- Rassier, P.J. 1987. Deputy Attorney General, Idaho Department of Water Resources, personal communication on December 21, 1987.
- Reynolds, M. 1986. Wyoming's new instream flow act: an administrative quagmire. Land and Water Law Review 21:455-483.
- Shupe, S.J. 1986a. Emerging forces in western water law. Resource Law Notes 8:2-8.
- Shupe, S.J. 1986b. The enforcement of state instream flow rights: legal, technical, and political challenges. Pages 53-69 in Proceedings of the 3rd Annual Western States Water Council Water Management Symposium, Los Angeles, CA.
- Shupe, S.J. 1988. Keeping the waters flowing: Streamflow protection programs, strategies, and issues in the West. Instream Flow Protection of the Western United States: A practical symposium. University of Colorado School of Law, Boulder, March 31-April 1, 1988.
- Slattery, K.O. 1986. Washington state's instream resources protection program. Pages 181-196 in Proceedings of the 3rd Annual Western States Water Council Water Management Symposium, Los Angeles, CA.
- State of Colorado, Department of Natural Resources, Water Conservation Board. 1985. Procedures for the administration of the instream flow/natural lake level program. 6 pp.
- Tarlock, A.D. 1975. Recent developments in the recognition of instream uses in western water law. Utah Law Review, Winter:34-66.

- Tarlock, A.D. 1978. Appropriation for instream flow maintenance: a progress report on the "new" public western water rights. *Utah Law Review* 211-247.
- Taylor, J.G., E.H. Zube, and J.L. Sell. 1987. Landscape assessment and perception research methods. Pages 361-393 in W. Michelson, R. Bechtel, and R. Marans, eds. *Methods in Environmental and Behavioral Research*. Van Nostrand, Reinhold Co. Inc., New York.
- Trelease, F. 1987. Wyoming State Engineer, personal communication on October 23, 1987.
- Trembley, T.L. 1987. Opportunities to protect instream flows in Colorado and Wyoming. *U.S. Fish Wildl. Serv. Biol. Rep.* 87(10). 91 pp.
- Trihey, E.W., and C.B. Stalnaker. 1985. Evolution and application of instream flow methodologies to small hydropower development: an overview of the issues. Pages 176-183 in F.W. Olson, et al., eds. *Proceedings of the Symposium on Small Hydropower and Fisheries*. American Fisheries Society, Bethesda, MD.
- Washington Department of Ecology. 1987a. Washington Water Resources Program: 8th Biennial Report to the Legislature - 1985/1986. Washington DOE, Olympia. 74 pp.
- Washington Department of Ecology. 1987b. Instream Resources and Water Allocation Program Review: Draft Environmental Impact Statement. Water Resources Program, Washington DOE, Olympia.
- Wesche, T.A., and P.A. Rechard. 1980. A summary of instream flow methods for fisheries and related research needs. Water Resources Institute, University of Wyoming, Laramie. 122 pp.
- Western Governor's Association. 1984. New challenge, new direction: the water policy report of the Western Governor's Association. Western Governor's Association, Denver, CO.
- Western States Water Council. 1986. Water management symposium: instream flows and the public trust. *Proceedings of the 3rd Annual Water Management Symposium*, Los Angeles, Sept. 11-12, 1986. 208 pp.
- White, M.R. 1982. Opportunities to protect instream flows in Alaska. *U.S. Fish Wildl. Serv. FWS/OBS-82-33*. 30 pp.
- Wilkinson, C.F. 1985. Western water law in transition. *University of Colorado Law Rev.* 56(3):317-345.
- Wilkinson, C.F., and H.M. Anderson. 1985. Land and resource planning in the National Forests. *Oregon Law Review* 64(1&2):1-373.

APPENDIX A

WESTERN STATE INSTREAM FLOW PROGRAMS: A STATE-BY-STATE SUMMARY

ALASKA

In 1980, the Alaska Legislature amended the State's Water Use Act to allow for the statutory protection of instream flows (AS 46.15.145). (For a discussion of Alaska's instream flow program, see Harle 1986:169-179; Estes and Harle 1987:1-2. For a discussion of the opportunities to protect instream flows in Alaska, see White 1982.) Regulations to implement this program were not approved until September 1983.

The instream flow law amended the Water Use Act in three important ways: (1) a reservation of water for instream use was defined as an appropriation; (2) beneficial use was defined to include navigation and transportation, fish and wildlife, recreational uses, and maintenance of water quality; and (3) an administrative process for reserving and appropriating water for instream flows and lake levels was outlined (Harle 1986:173).

Under Alaska's instream flow program, instream flows may be appropriated to ensure that a sufficient flow of water in a stream, or level of water in a lake, will remain in the stream or lake and will not be appropriated or diverted for another use. A reservation of water is a water right to maintain a specified instream flow or level of water at a specific point or part of a stream or water body throughout the year or for specified times (AS 46.15.145 (a)). An instream flow reservation is not a required permit, but rather an optional water right.

Alaska's instream flow program was brought about as a result of three major issues: (1) the State's need for an administrative process to adjudicate instream water rights that might be asserted by the Federal Government; (2) the fishing industry and fishery management agencies' concern that there was no legal mechanism to establish water rights to maintain streamflows for fish habitat and production, other than putting conditions on water rights permits; and (3) concern that reduced streamflow might affect water quality conditions downstream from municipal treatment plants and mining operations (Alaska Department of Natural Resources 1985:6).

The purpose of Alaska's instream flow program is to establish a mechanism whereby private parties and public agencies can apply for and acquire reservations of water for instream uses. An instream flow reservation may be acquired on any stream or water body throughout the State that is not fully

appropriated. Reservations may be acquired under Alaska's instream flow program for the following beneficial uses: (1) protection of fish and wildlife habitat, migration, and propagation; (2) recreation and park purposes, including scenic, natural, historic, or cultural values; (3) navigation and transportation; and (4) water quality (AS 46.15.145(a); 11 AC 93.41(2)).

Any private individual or organization, along with public agencies, may apply for and acquire an instream flow reservation. The Alaska instream flow program is unique in this respect since it allows private citizens and organizations to apply for and receive an instream flow or lake level reservation (AS 46.15.145(a)).

The Department of Natural Resources (more specifically the Division of Land and Water Management) is responsible for administering the instream flow program. An application for a reservation of water must be made to the Alaska Department of Natural Resources (ADNR) and must (1) identify the purpose of the proposed reservation, (2) identify the name of the stream or water body in which the water is proposed to be reserved, (3) identify the location of the proposed reservation, including upstream and downstream boundaries of the reservation, (4) explain what need exists for the proposed reservation, and (5) quantify the water requested to be reserved (11 AAC 93.142).

To date, the Alaska Department of Fish and Game (ADFG) has been the only entity to apply for and receive instream flow reservations. It uses this process for streams that (1) support sport fisheries, (2) are most likely to have out-of-stream competition, (3) have sufficient data bases to support reservation application requirements, and (4) would probably not be protected under some other Federal or State regulation or process that could, in theory, provide similar protection.

In Alaska, the burden of proof for providing hydrologic and biological data required to support an instream flow reservation application is placed on the applicant (Estes and Harle 1987:8-14). Although the application of a specific method for providing these data is not designated or required by law or regulation, the ADNR recommends the Montana (or Tennant) or a similar method when competition for water is minimal. The Instream Flow Incremental Methodology or a similar method is recommended for situations where a complete evaluation of all flow options or specific responses of fish species/life phases are required (Estes and Harle 1987:1; Estes 1987:2).

When an application for an instream flow reservation is accepted by the Department of Natural Resources (the agency assigned responsibility to determine and adjudicate water rights and to administer the Water Use Act), public notice must be given once in a newspaper of general distribution in the vicinity of the proposed reservation of water. Individual notice is served on prior appropriators who may be affected by the new reservation of water, the Departments of Fish and Game and Environmental Conservation, any local government in whose jurisdiction the proposed reservation of water would occur, and any other interested parties (AS 46.15.133).

These agencies and interest groups may request a public hearing on the proposed reservation, and the ADNR may hold one if it determines that it is

necessary. The commissioner of the ADNR must issue a certificate of reservation if four criteria are satisfied: (1) the rights of prior appropriators will not be affected by the reservation; (2) the applicant demonstrates a need for the reservation; (3) there is unappropriated water in the stream or water body sufficient for the reservation; and (4) the proposed reservation is in the public interest (AS 46.15.145(c)). The public interest criteria in AS 46.15.080 for divisionary water uses are also used to evaluate instream uses of water.

Certificates of reservation are, by regulation, issued to the applicant, and may be subject to conditions. Regulations specify that two conditions must be included on certificates of reservation (Harle 1986:175). First, the certificate of reservation may not be abandoned, conveyed, transferred, assigned, or converted to another use without the approval of the ADNR. Second, the certificate holder may not restrict access to, on, or through the reserved water or prohibit the use of the reserved water from other compatible instream uses. Once a reservation of water is granted, it is withdrawn from divisionary appropriation. The priority date for an instream flow reservation is the date the ADNR receives a completed application.

Regulations allow the Department of Natural Resources to require measuring devices to be installed and maintained to monitor and report on the reserved instream flow (11 AAC 93.146(d)(1)). While the ADNR can monitor flows through this measuring and reporting system, it also encourages certificate holders to monitor instream flows. So far, the strategy has been to leave it up to the holder of the reservation to monitor the flows. In the case of the one granted instream flow right, located on the Terror River, there is an automated gaging station on site that relays flow data via satellite telemetry. The Alaska Department of Fish and Game, the holder of the reservation, monitors the flow daily and will notify the ADNR if the required flows are not present (Harle 1986).

Those holding an instream flow reservation have a legal standing to assert their right against conflicting uses of water by people who do not have water rights or who are junior in priority. In addition, unlike divisionary water rights granted under the Alaska Water Use Act, reservation of water for instream uses must be reviewed at least once every 10 years, but can be reviewed any time within the 10-year period, if necessary (AS 46.15.145(f)). The purpose of the review is to determine if the purpose and need for the reservation still apply, if the reservation affects prior appropriations or the public interest, if a new beneficial use of water has been proposed, if new information is available about the reservation, if the quantity or level of water reserved is adequate for the purposes of the reservation, if the time periods still apply, and if additional data collection and analysis are required (Harle 1986:175). At the conclusion of the review, findings are written and the certificate of reservation is continued, amended, or revoked.

While Alaska has had little experience enforcing instream water rights, the general procedure with all enforcement actions is to first work with the parties informally to solve the problem. If necessary, the water commissioner may issue cease and desist orders to correct the situation (11 AAC 93.270-290). With respect to instream flow enforcement, the informal procedure has worked

satisfactorily to resolve the problems that have been encountered to date with the one certified instream water right.

As of November 1987, Alaska has reserved water for instream flows on only one stream segment (State of Alaska Water Rights, Certificate of Reservation, LAS 1824). This segment is 4.2 miles long, with an annual average discharge of 94 cfs. The Alaska Department of Fish and Game established its own instream flow program in July 1986, and filed five more applications for instream flows in June 1987, for a total of 28.6 stream miles (Estes and Harle 1987:1). All five applications have been accepted and are pending adjudication. The six reservation applications represent a total of 32.8 stream miles, or less than one percent of the total perennial stream miles in the State, and constitute about 6% of the total water use in the State. The Alaska Department of Fish and Game expects to submit a minimum of six more reservations to the ADNR prior to July 1988.

Of the five reservation applications that have been accepted by the ADNR but not adjudicated, only two have active gaging stations. The ADFG will monitor the flows of the streams with gages, but will have to rely on casual observations for the other streams to determine if any problems are flow related.

ARIZONA

In 1976, the Arizona Court of Appeals in McClellan v. Jantzen (26 ARIZ. App. 223, 547 P.2nd. 494 [1976]) ruled that the concept of in situ appropriation of water is permissible. For a discussion of the opportunities to protect instream flows in Arizona, see Nelson et al. 1978a. The 1976 court decision deemed recreation, fish, and wildlife to be beneficial uses of water and this implied a sanction of instream water rights. Since 1980 there have been a number of private applications for instream water rights submitted for the Department of Water Resources. Two of these applications were approved. No rules guiding the Department in these matters have yet been approved (Shupe 1988).

CALIFORNIA

California has no legislation to protect instream flows. However, the State routinely conditions new water rights to require bypass flows. A 1987 statute seeks to improve the enforcement of these bypass conditions and the State's wild and scenic rivers law also serves to protect flows on some north coast rivers. In 1983, the State Supreme Court recognized the Public Trust Doctrine creating a potential for instream flow protection (Shupe 1988; see also, Nelson et al. 1978b).

COLORADO

In 1973, the Colorado General Assembly enacted legislation creating what is generally known as the "Colorado Instream Flow/Natural Lake Level Program"

(CRS 37-92-102). (For a discussion of the program, see Jenscock and Merriman 1986:159-168. For a discussion of the opportunities to protect instream flows in Colorado, see Nelson et al. 1978c, Trembley 1987.)

The program operates within the existing water rights system by appropriating water rights for instream uses. Although the instream flow program operates within the complex water rights system in Colorado, it changed that system in three significant ways: (1) it redefined the term "beneficial use" to include the appropriation of minimum stream flows and lake levels for the preservation of the natural environment; (2) it deleted the requirements that diversion would be an integral part of an appropriation; and (3) it vested the exclusive right for the appropriation of instream flows with a State agency (Jenscock and Merriman 1986:161).

The program resulted from the recognition of the need to correlate the activities of mankind with some reasonable preservation of the natural environment (CRS 37-92-102(3)). The purpose of the instream flow program is to appropriate the waters of natural streams and lakes such that the natural environment might be preserved to a reasonable degree (CRS 37-92-102(3)). Instream flows may be appropriated on any natural stream or lake throughout the State for the purpose of preserving the natural environment to a reasonable degree (CRS 37-92-102).

Under Colorado's instream flow program, only the Colorado Water Conservation Board (CWCB) is allowed to appropriate water for instream uses (S.B. 212, 56th General Assembly, 1st Session, 1987). The CWCB, a State agency charged with the protection, conservation, and development of Colorado's water resources, is also responsible for administering the program. It administers the program with technical assistance from the Division of Wildlife and the Division of Parks and Outdoor Recreation.

In the process of identifying streams and lakes to protect under the instream flow program, the CWCB requests recommendations from the Division of Wildlife (DOW), the Division of Parks and Outdoor Recreation (DPOR), and Federal land management agencies (CRS 37-92-102(3); State of Colorado 1985:1). Recommendations typically consider the level of water resources development within a basin, the fishery resource value of the streams, and the necessary level of protection (Jenscock and Merriman 1986:163).

The location and amount of an instream flow requirement is generally determined by the use of the R2 Cross method, which involves selection of streams based on hydrologic and biological characteristics. Once a stream is identified for study, a survey is conducted to measure stream flows and depths. This data is then run through a computer program to give a cross-sectional analysis of discharge at certain water levels in the stream. In addition, a biological study of the fisheries is performed. Once these hydrologic and biological parameters have been determined, the DOW, DPOR, or the Federal land management agencies report their findings to the CWCB staff along with their recommendation for a minimum flow. To date, only the DOW has recommended flows to be protected.

Upon receipt of the recommendations from the DOW, DPOR, or Federal land management agencies, the CWCB reviews the recommendations and the supporting data (State of Colorado 1985:1). Following their review, the CWCB staff prepares a preliminary recommendation and must mail a preliminary notice of instream flow appropriation to the parties interested in instream flow protection, including municipal governments, county commissioners, environmental groups, recreational water users, traditional water users, and land management agencies (State of Colorado 1985:2-3).

Before submitting a final notice, the CWCB staff consults with appropriate Water Division Engineers and with other parties as they deem appropriate (State of Colorado 1985:1). Any comments received by the CWCB from these parties and through the preliminary public comment period are reviewed and any potential conflicts or issues addressed. The staff attempts to resolve all objections to its final recommendations prior to publishing its final notice.

After this public notification and comment period, the CWCB weighs all the evidence for a proposed instream flow appropriation and elects to either approve the recommendations, table any decision and request additional data or staff review, or reject the final recommendations (State of Colorado 1985:1-2). In order for the board to approve an instream flow appropriation application, it must determine that such an appropriation will preserve the natural environment to a reasonable degree and not materially injure other water rights.

If the CWCB approves the final recommendations for an instream flow appropriation, the Attorney General's office files a water rights application with the appropriate water court (State of Colorado 1985:2). The water court then processes the application, any additional issues or conflicts are resolved, and the instream flow water right is established.

The priority date for instream flow appropriations in Colorado is the date the Colorado Water Conservation Board acts to approve the appropriation (State of Colorado 1985:2).

To protect the instream flow rights, the CWCB staff reviews the monthly water court resumes of each water division that lists all the water rights applications, changes of water rights, and plans for augmentation (State of Colorado 1985:4). If a proposed change in water right could potentially injure the instream flow right, the CWCB may file a statement of opposition with the court or protest the referee's ruling to insure noninjury. To date, the CWCB has not had to place a call on any stream to protect the instream flow right.

As of December 1986, Colorado's instream flow program consisted of 1,074 stream segments (930 decreed and 144 undecreed) totaling 6,632.7 miles (5,546.2 decreed and 1,806.5 undecreed) (Memorandum on file at the CWCB offices regarding the status of the instream flow program as of December 1, 1986), or about 26% of the total perennial stream miles in the State. A total of 11,296.5 cfs has been protected under the program, accounting for about 28% of the total water use in the State. The program also has protected 485 natural

lakes, but this component of the instream flow program was virtually suspended in the late 1970's.

HAWAII

The Hawaiian system of water rights is unlike any other system used in the United States. It is based on ancient usage practices of the Hawaiian natives. Under those practices, surface water, along with lands, were the property of the King of Hawaii. In 1848, the King issued the "Great Mahele" wherein he shared ownership of his lands with the Hawaiian kingdom. The private rights thus conferred were interpreted to also afford water rights to allow the new land owners water sufficient to carry out their lives as before. (For a discussion of Hawaiian water rights as they affect instream flow regulation, see Draudt [n.d.]).

In 1973, the McBryde decision by the State Supreme Court of Hawaii [54 HAW. 174, 504 p.2d 1330 (1973)] was an attempt to establish State ownership of all surplus waters and to limit the transferability of private water rights. However, this decision was soon overturned by the U.S. District Court of Hawaii in Robinson vs. Ariyoshi (1977 441 F. Supp. 587) as unconstitutional for taking private property without compensation.

The initiation of instream flow protection first occurred in Hawaii in July 1982 with the passage of the Hawaii Instream Use Protection Act of 1982 (HRS 176D). By this Act, instream use is defined as beneficial uses of water for purposes located in the stream. Beneficial uses include (but are not limited to): fisheries and water related wildlife resources; outdoor recreation activities; ecosystems such as estuaries, wetlands, and stream vegetation; aesthetic values; navigation; hydropower; maintenance of water quality; and conveyance of water to downstream diversion uses.

The Instream Use Protection Act was restrictive in its implementation strategy. Only the Board of Land and Natural Resources could establish instream use protection, and only for Windward Oahu. The Act was to expire upon the enactment of a Statewide Water Code. Infractions of the rules for instream flow protection were established as punishable by civil fine of up to \$1000, plus \$500 per day that the infraction persists.

In 1983, the Board of Land and Natural Resources published "Proposed Rules for the Instream Use Protection Program" (Title 13, Subtitle 7). These rules established principles and standards for Windward Oahu. To protect the quality of natural streams environments for the uses established by the Act, these "Principles" shall guide: systematic baseline studies will be made; permits will be required for stream channel alteration; that the natural interrelationship is recognized between surface and groundwaters; the importance of instream flows will be balanced with present or potential uses of the water; and public input will be sought at all stages. Baseline studies included field investigations, collection of hydrological data, and determination of flow requirements for significant instream uses.

Standards of these Proposed Rules stated that the Board of Land and Natural Resources initiate proceedings and decide an instream flow standard when the Board finds the public interest so requires. Interim standards may be petitioned by any person desiring establishment of an instream flow standard. Further, any person may initiate a petition or judicial review of an instream flow standard in order to modify or rescind a standard.

The State Water Code, Chapter 174C, became effective in July 1987, superceding the Instream Use Protection Act. However, the new Code incorporates the policies and intent of the Instream Act as an integral portion of the statewide water management system. The Code begins with the policy statement that "waters of the State are held for the benefit of the citizens of the State." Although this is something of a departure from traditional water law in Hawaii, Part IX of the Code states that Native Hawaiian water rights are not to be abridged, that compensation must be paid for any loss of trust revenues that might result, and that appurtenant water rights of kuleana and taro lands shall not be extinguished nor diminished.

The State Water Code is to be "liberally interpreted" to achieve maximum beneficial use with adequate protection of traditional water rights. Beneficial uses specifically include protection of fish and wildlife, maintenance of ecological balance and scenic beauty, and preservation and enhancement of water of the State for public recreation, among other uses, and for water quality. Powers to implement the State Water Code are reserved for the newly created Commission on Water Resources Management [Commission].

Under the Code, the Commission is to implement a Hawaii Water Plan by which Counties will be divided into hydrologic units, where possible, and for each such unit the Commission will establish an instream use and protection program. Consideration is to be given to public recreation, environment, and fish and wildlife in establishing instream programs. Further, permits for diverting water in declared Water Management Areas may be denied if the diversion might detrimentally affect instream uses.

Part VI of the Code is devoted entirely to "Instream Uses of Water." This section directs the Commission to establish standards on a "stream-by-stream basis," in general following the same set of procedures as the Instream Use Protection Act; the Commission determines standards, publishes reasons for or against such standards, describes flows necessary to protect public interests, investigates the stream and compares instream values with diverted use values, and gives public notice and hearings.

The State Water Code establishes a schedule for setting interim instream flow standards as indicated:

Windward Oahu	July 31, 1987
East Maui and Kauai	December 31, 1987
Hawaii and Molokai	July 1, 1988
West Maui and Leeward Oahu	December 31, 1988

In November 1987, the State Attorney General informed the Department of Land and Water Resources that the newly formed Commission on Water Resources

Management, not the Board, was to consider and adopt all standards for areas beyond Windward Oahu (Paty 1988). However, the Commission cannot so function without first promulgating Administrative Rules, which are anticipated by mid-1988. Thus the schedule for interim instream flow standards may be set back by as much as a year.

To date, instream flow standards for Hawaii have concentrated almost entirely on rivers in Windward Oahu. Interim standards were approved for this region in July 1987.

IDAHO

The State of Idaho passed the Minimum Stream Flow Act in 1978 (IC 42-1501 to 42-1505). Water may be appropriated for instream flows in Idaho (IC 42-1503). (For a discussion of Idaho's instream flow program, see Beeman and Arment 1986:31-51. For a discussion of the opportunities to protect instream flows in Idaho, see Nelson et al. 1978d, Brandes 1985.)

One cause of Idaho's instream flow program was the State's recognition that public health, safety, and welfare required that streams within the State, along with their environments, must be protected against the loss of water supply (IC 42-1501).

The purpose of Idaho's instream flow program is to preserve minimum stream flows necessary for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, transportation and navigation, and water quality (IC 42-1501). Apparently, instream flows may be appropriated on any stream within the State that has unappropriated water (IC 42-1501 and IC 42-1503).

The Idaho Department of Water Resources is responsible for administering the instream flow program. Under this program, the Idaho Water Resource Board (WRB) is the only entity that is authorized to apply for and hold a water right for an instream flow. Under the "Idaho Water Resource Board Guidelines on Minimum Stream Flow Applications," on which the following discussion is based, petitions for minimum flow applications can only be received from public agencies of local, State, and Federal governments. Any private individual or organization aware of a stream needing protection may contact an interested public agency and request that it petition for a minimum stream flow.

A representative of the public agency is required to present the petition at a regularly scheduled meeting of the WRB. If the petition for application appears to be valid on its face, and there appears to be a need for preservation of a minimum flow, the board immediately files an application with the Director of the Water Resources Department. This application must be made immediately, since disclosure of a desire to appropriate a minimum streamflow could incite water developers to make filings as well. It is important to note, however, that the board's acceptance of the petition and filing of the application does not preclude the board from modifying or even abandoning the application if it is later discovered that the quantity or

location of the instream appropriation is imprudent or otherwise not in the public interest.

After the Director of the Department of Water Resources receives an application for an instream flow appropriation, and before setting a time for a public hearing, a notice of the application is forwarded to the Departments of Fish and Game, Health and Welfare, Parks and Recreation, and any other public agency likely to have an interest in or knowledge of the issues involved. The public agency making the request is responsible for identifying property owners adjacent to the stream where the appropriation is located and explaining the nature and intent of the minimum streamflow appropriation.

If it appears that the minimum flow application will be formally contested or that there is either hostility or lack of understanding, the board provides for an informal public meeting. Notice of the meeting is through publication in a newspaper in the area of the proposed instream appropriation, and by a press release in the name of the board to those newspapers and radio and television stations that serve people residing in the affected area.

Following this public meeting, the Department of Water Resources provides the board with all the relevant information concerning the application, including description of all water rights or applications that may be in conflict. At this time, the board decides to proceed with the application as originally received or to modify or even abandon the application. The board then notifies the director of the DWR and the director schedules a formal public hearing to determine whether a minimum flow water right should be granted.

Notice of the formal public hearing is published for two consecutive weeks prior to the date of the hearing, in a newspaper published in the area. A press release announcing the formal public hearing is also sent to all newspapers and radio and television stations serving the area. Notice of the public hearing is also sent directly to adjacent landowners or holders of possible conflicting water rights or pending applications, and to any persons who attended the informal public meeting.

After the formal public hearing, the board retains the right to further modify or withdraw the application in light of major irreconcilable problems that may have surfaced at the public hearing. If the director does not receive any notification from the board after the formal public hearing, it is presumed that the board desires to proceed with the application. The director then issues a written decision approving or denying the application for a permit. The decision is subject to judicial review on the record created before the director.

Approved applications must be submitted to the legislature by the fifth day of the next legislative session. The legislature's failure to act within that session constitutes final approval. An Idaho Attorney General opinion questions the constitutionality of this legislative veto provision (Jones 1987).

The priority date for an instream flow appropriation is the date that a complete application is received in the Office of the Director of the Department of Water Resources (IC 42-1505). To monitor instream water rights in Idaho, approved instream flow permits are conditioned by the Department of Water Resources to require the installation of stream gages that may be used by the State watermaster in delivering and monitoring the right (Rassier 1987).

As a water right under the prior appropriation doctrine, instream flow rights are enforced by not allowing appropriations of a late priority date if diversion of such water would result in a decrease in the flow of the stream or level of the lake below the minimum level specified in the approved application (IC 42-1505). Idaho has not yet experienced the necessity to shut off junior rights to fill an instream flow water right (Rassier 1987).

As of February 1987, Idaho's instream flow program consisted of 35 stream segments (16 approved and 19 pending) totaling about 224 miles, or less than 1% of the total perennial stream miles in the State. The total quantity of water acquired and applied for under the program is about 9,131 cfs per year (Minimum Stream Flow Applications and Permits - Summary Status and CFS, on file at the Department of Water Resources, February 2, 1987; Status of Minimum Streamflow Water Rights, on file at the Department of Water Resources, February 2, 1987), or about 6% of the total water use in the State.

MONTANA

In 1973, the Montana Water Use Act was enacted and set forth a system for the protection of instream flows (MCA 85-2-316). (For a discussion of Montana's instream flow program, see Fritz et al. 1986:97-107. For a discussion of the opportunities to protect instream flows in Montana, see Nelson et al. 1978e, Brandes 1985, Bristow and Gould 1986.)

Montana's instream flow program provides an opportunity to reserve water for future uses. Once granted, a reservation not only sets aside water for a particular use, but also becomes a water right. Those who are eligible to use reserved water can appropriate it long after it has been granted and still maintain the early priority date. The reservations do not prevent further appropriations on the same stream, but they do provide legal standing to the reservation holders to object to permit applications that could adversely affect the instream flow reservation.

The reservation program was established in response to the need to administer water rights in a more orderly and centralized manner. This need, in turn, was spurred by large-scale coal exploration and water development throughout the State. The purpose of Montana's instream flow program is to provide a means whereby water can be reserved for future diversionary uses as well as for maintaining stream flows for the protection of existing water rights, aquatic life, and water quality. Water may be reserved for existing or future beneficial uses in six river basins, including the Clark Fork River and its tributaries, the Kootenai River and its tributaries, the St. Mary River and its tributaries, the Little Missouri River and its tributaries, the

Missouri River and its tributaries and the Yellowstone River and its tributaries.

Under Montana's instream flow program, water may be reserved for the following beneficial uses: future irrigation, municipal growth, multipurpose storage, recreation, fish and wildlife, and maintenance of water quality. The State or any political subdivision of the State may reserve water for instream flow uses (MCA 85-2-316).

The Board and Department of Natural Resources and Conservation are responsible for administering the State's instream flow program. Applications for water reservations must include a description of the purpose, a quantification of the purpose, an analysis of the need, a quantification of the amount of water requested as well as the amount available, proof that the reservation is in the public interest, and a management plan (ARM 36.16.104).

Upon receiving the application, the Department of Natural Resources and Conservation (DNRC), processes it through the procedures outlined in MCA 85-2-307 through MCA 85-2-309. In general, the DNRC is required to publish the facts of the application in a newspaper of general circulation in the area of the proposed reservation. In addition, it must notify any water user, including Federal agencies, that may be affected by or interested in the proposed reservation. The DNRC may also notify other State departments with an interest in the reservation.

After this notification process, the DNRC must accept objections, if any, to the proposed reservation (MCA 85-2-308). Those objecting to the reservation must specify how it would adversely affect their water rights or other interests. If the DNRC determines that an objection is valid, it must then hold a public hearing (MCA 85-2-309).

Once the objections have been resolved, the board may adopt an application reserving water provided that the applicant has shown that:

- 1) there is a purpose and need for the reservation;
- 2) the amount of water requested is necessary for the stated purpose of the reservation;
- 3) the reservation is in the public interest; and
- 4) special criteria are met if the use is to be out-of-State (Fritz et al. 1986:100).

Unless otherwise specified by the legislature, the priority date for a reservation is the date the board adopts an order reserving water (MCA 85-2-316(9)).

As part of the application process, a management plan is required that, among other things, must outline a strategy for monitoring instream flows (ARM 36.16.106(2)). At the very least, the management plan should list existing stream gaging stations in the affected river basin, identify stream reaches

where historic streamflow records are available, and analyze the cost and feasibility of purchasing and installing needed gaging stations, or describe how instream flows in ungaged reaches will be estimated and protected from future depletions.

Reservations are to be reviewed at least once every 10 years, and if the objectives of the reservation are not being met, the board may extend, revoke, or modify the reservation (MCA 85-2-316(10)). If the total amount of an instream flow reservation is not needed to fulfill its purpose, the board is allowed to reallocate the excess to another reservant, if the reallocation applicant can show that his need outweighs the need of the original reservant (MCA 85-2-316(11)). Reallocation may only take place once every 5 years, and the reservation retains its original priority date.

To date, instream flows have been reserved on 69 stream reaches in the Yellowstone River basin. The 69 stream segments constitute a total of about 2,078 stream miles, or approximately 12.5% of the total perennial stream miles in the State. A yearly average flow of about 28,357 cfs has been reserved in the Yellowstone River Basin for instream uses, which accounts for about 18.5% of the total water use in the State. In addition to the instream flows that have been reserved in the Yellowstone River basin, applications are pending on 25 stream segments in the Clark Fork River basin in western Montana. If approved, these 25 segments will constitute a total of about 400 stream miles, or about 2.5% of the total perennial stream miles in the State. A yearly average of about 2,155 cfs would be reserved, or about 2% of the total water use in the State. A basinwide proceeding to reserve water in the Missouri River watershed is currently underway.

NEVADA

Nevada statute provides that the use of water for any recreational use is a "beneficial use" (NRS 533-030, 1983). The Nevada Supreme Court has recognized the concept of in situ appropriation of water for a beneficial use, including recreation and fishing (Septoe Livestock Co. v. Gulley, 53 NEV. 163, 295 P.2nd. [1931]; U.S. v. Alpine Land and Reservoir Co., 503 F. Supp. 877 [D. Nev. 1980]). Pursuant to these cases, the Nevada State Engineer has granted some instream flow rights to private parties and to Federal agencies. The State Engineer's actions are currently being litigated. (See generally, Nelson et al. 1978f, and Shupe 1988).

OREGON

Oregon has been a leader in the protection of instream flows since 1955, when it passed a "minimum streamflow" law (ORS 536.310(7)). (For a discussion of Oregon's instream flow program, see Learn 1986:125-128. For a discussion of the opportunities to protect instream flows in Oregon, see Nelson et al. 1978h, Brandes 1985.)

Under its instream flow program, the State of Oregon may reserve or withdraw water from the appropriation system for future uses, including

instream flow maintenance. Streamflows that are protected under this program are considered water rights (Senate Bill 140, 64th Oregon Legislative Assembly, 1987 Regular Session). Like consumptive water rights, they have priority dates and are subject to the same variations in water availability as other appropriations. Water rights with priority dates junior to the minimum streamflows (other than for human or livestock consumption) are required to be turned off when the water flow in the stream drops below the adopted minimum stream flow (Brandes 1985:26).

Oregon's instream flow law specifies that maintenance of minimum perennial streamflows sufficient to support aquatic life and pollution abatement shall be fostered (ORS 536.300(7)). Apparently, instream flows may be reserved on any unappropriated stream throughout the State. The instream flow statute identifies fish and wildlife, water quality, and recreational activities as the only beneficial uses of instream water (ORS 536.310(7); SB 136, 1987). According to SB 24 (1987), instream flows may also be protected by encouraging water conservation projects that would allocate a portion of the conserved water to the State for instream flow purposes.

The Oregon Water Resources Department is the only entity that is allowed to acquire an instream water right (SB 140, 1987). However, the Oregon Departments of Fish and Wildlife and Environmental Quality and the Parks and Recreation Division of the Department of Transportation may request instream water rights.

The Oregon Water Resources Department (WRD) and the Water Resources Commission (WRC) are responsible for administering the State instream flow program. The process for reviewing minimum streamflow applications is currently outlined in OAR 690-76-020, but may be revised in light of SB 140, which calls for the establishment of standards, criteria, and procedures by which a State agency may request an instream water right. After receiving an application, the WRD must invite public comment on the application, along with other water needs and problems within the stream basin, by making the application available for public review. This includes notifying the news media located in the basin, State agencies, local planning departments, county commissioners, and others that have expressed an interest in minimum perennial streamflows.

During the public review period, the WRD must analyze streamflow and water use information and prepare a recommendation on the proposed action. The WRC will then schedule a hearing and make available, at the time of the notice, all minimum streamflow applications, preliminary findings and analysis of alternatives, and the recommended action. At least one member of the WRC must then hold a public hearing in the affected basin to consider the proposed action. Interested persons, organizations, and local, State, and Federal agencies may speak at the hearing or provide written comments. If the WRC decides that it is in the public interest, additional hearing may be held to consider the proposed actions. Finally, the WRC will make a decision on the proposed minimum streamflow after reviewing the hearing record and a final recommendation of the WRD.

After reviewing all the relevant information, the WRC must take one of three actions: (1) adopt the recommended minimum streamflow, (2) adopt a minimum streamflow at some other flow rate determined to be more appropriate for supporting aquatic life and minimizing pollution, or (3) reject the minimum streamflow after finding that establishment of a minimum streamflow is of lesser importance than other uses of the water of a particular stream (ORS 536.325(4)). If the WRC adopts a minimum perennial streamflow, its priority date is the date the ODFW or DEW filed an application with the WRC, rather than the date the application is accepted by the WRC (ORS 536.325(3); also see SB 140, section 6). This provision brings instream flow reservations in line with traditional appropriative rights, which have always been established on the date the permit application was filed.

Minimum streamflows established by the WRC become effective only when water is insufficient to satisfy both minimum flow requirements and junior appropriative rights. When this occurs, the Water Resources Director and his appointed watermasters must regulate the junior water permit holders.

As of November 1987, Oregon's instream flow program consists of 455 stream segments, and a total of 68,213.13 cfs per year have been set aside, or about 6% of the State's total water use.

UTAH

In 1986, the Utah General Assembly enacted a law specifically designed to protect instream flows (UC 73-3-3). (For a discussion of Utah's instream flow program, see Morgan 1986:197-201. For a discussion of opportunities to protect instream flows in Utah, see Nelson et al. 1978i).

The 1986 instream flow law allows the State Engineer to recognize instream flows as a beneficial use, not subject to a diversion requirement, and provides a means to protect the quantity of water in streams.

Utah employs a very restrictive instream flow strategy. Apparently, only the Division of Wildlife may acquire an appropriative right for instream uses, and even then, they may only file an application for a temporary or permanent change on an existing perfected water right that is acquired through funding provided by the legislature or by lease agreement, exchange, contribution, or appurtenant water rights acquired by the acquisition of real property for other wildlife purposes (Morgan 1986:200). The division cannot acquire title or a long-term interest in the water right without prior legislative approval. Neither is the division allowed to appropriate unappropriated water for instream flows or to acquire water rights by eminent domain for instream flows.

The limited and sole purpose of the program is to provide water for instream flows that are necessary for the preservation or propagation of fish. The only beneficial use recognized under Utah's instream flow program is the preservation and propagation of fish.

As of November 1987, the State of Utah had not protected any instream flows under its newly created instream flow program. In addition, it had yet to promulgate any regulations or procedures for the program.

WASHINGTON

The State of Washington has two laws specifically designed to protect instream flows. The first, passed in 1967 and referred to as the Minimum Water Flows and Levels Act, authorized the Department of Ecology to establish minimum water flows and levels by administrative rule for streams and lakes (RCW 90.22). The second, known as The Water Resources Act of 1971, provides that perennial rivers and streams of the State shall be retained with base flows necessary to provide for the preservation of wildlife, fish, scenic, aesthetic, and other environmental values, and navigation (RCW 90.54). (For a discussion of Washington's instream flow program, see Slattery 1986:181-196. For a discussion of the opportunities to protect instream flows in Washington, see Nelson et al. 1978j, Brandes 1985.)

Under these laws, instream flows are protected by reserving water for future beneficial uses, including both offstream and instream uses. These reservations constitute appropriations, and may be acquired on any stream throughout the State (RCW 90.03.247).

Based on the statutes cited above, the Department of Ecology has initiated a basin-planning process to address instream flow needs. This program is formally referred to as the Washington Instream Resource Protection Program (Washington Department of Ecology 1987a,b). Under this instream flow program, water may be reserved for several beneficial uses, including the preservation of wildlife, fish, scenic, aesthetic, recreation, and other environmental values, navigation, and water quality (RCW 90.54.020(1)). Only the Washington Department of Ecology is allowed to reserve and acquire waters for instream flow uses. The Department's of Fisheries and Wildlife may request that the Department of Ecology establish minimum flows (RCW 90.22.010).

The Department of Ecology is responsible for administering the State's instream flow program. When establishing instream flows, the Department of Ecology assesses the flow needs of fish, wildlife, recreation, scenic, aesthetic, and environmental values, along with water quality and navigation (Slattery 1986:184). The resulting flows are evaluated with regard to the availability of water to meet these needs. If sufficient water is unavailable to satisfy instream flow needs, the Department of Ecology may either propose to close the stream to further consumptive appropriation, or put a hydrologic cap on the instream flows it is willing to propose for adoption (Slattery 1986:184-185).

In adopting an instream flow regulation, the Department of Ecology follows a standard agency rule-making process involving notice, hearings, and a public comment period (Slattery 1986:185). The State Ecological Commission also reviews proposed rules (and may block adoption if five or more of the seven members oppose the proposed rules), the Director of the Department of Ecology makes the final adoption decision, and the rules go into effect 30 days after

adoption. Aggrieved parties may appeal administrative rules to the State court (Slattery 1986:185).

Once the instream flow rules are in effect, Department of Ecology regional offices commence with considering water right applications for the affected streams (Slattery 1986:185). Any proposed consumptive use of water that would result in diminishment of streamflow is subject to the instream flows and stream closures established by the regulation. Any new consumptive appropriation is conditioned to require that the diversion cease when the flow of the stream falls below the instream flow established by regulation. Applications for consumptive use on a closed stream are denied. A 1979 Water Code amendment (RCW 90.03.247) stipulates that the establishment by administrative rule, of an instream flow reservation, constitutes an appropriation with a priority date as the date of adoption.

The Department of Ecology monitors streamflows through several telemetered networks of stream gauges. It also monitors runoff forecasts published during the winter and spring. When it appears that instream flows are not likely to be met, the department sends a letter to rights holders with conditioned rights. The letter notifies the rights holders that they may be regulated in the upcoming season and should plan accordingly. It also provides the telephone number for a toll-free recorded message that provides up-to-date information on streamflow conditions. The message is updated daily and informs water users if their diversions may be used or not.

When the streamflows drop below the specified level, local media are informed and usually provide public service announcements. Field personnel are dispatched to monitor compliance. Failure to comply is subject to penalties and, ultimately, incarceration. One problem with this monitoring system is that the fine for noncompliance is limited to \$100 per day. Some irrigators are willing to pay this as a cost of doing business.

In general, the Department of Ecology has had good success in enforcing instream flows in most areas of the State, and all of the enforcement actions have generally been upheld on appeal.

As of February 1987, Washington's instream flow program consisted of 172 stream segments with minimum flows established, and another 300 or more streams closed to further consumptive appropriation, many of which overlap with the minimum flow segments (Washington Department of Ecology 1987b). On the basis of information obtained for 113 of these segments, a total of 598,871.92 cfs per year is protected for instream flows, including 557,324.17 cfs per year for seven segments on the Columbia River.

WYOMING

Following 10 years of proposals, debate, and compromise, the State of Wyoming enacted an instream flow law in March 1986 (WS 41-3-1001-1014). Wyoming's instream flow law outlines a process to appropriate waters for instream uses. (For a discussion of Wyoming's instream flow program, see

Fassett 1986:109-124. For a discussion of the opportunities to protect instream flows in Wyoming, see Nelson et al. 1978k, Trembley 1987.)

Wyoming's instream flow program was created because of a general concern with the protection of instream flow values. More specifically, the law was enacted when, in the absence of action by the legislature, local conservation groups sponsored a petition to get the instream flow issue on a Wyoming general election ballot. After collecting the required number of signatures, the issue became the first public initiative ever to qualify for a general election ballot. Before the general election in November 1986, the legislature acted and passed the instream flow law (Fassett 1986:110).

Unappropriated water flowing in any stream or drainage may be appropriated for instream uses except on water included as a portion of the consumptive share of water allocated to the State of Wyoming under any interstate compact or United States Supreme Court decree (WS 41-3-1006(g)). In addition, the amount of water appropriated for instream flows shall not be permitted to exceed the amount of water that is allocated under an interstate compact or a Supreme Court decree (WS 41-3-1006(h)).

The storage of water in any drainage for the purpose of providing a recreational pool or the release of water for instream flows to establish or maintain new or existing fisheries is recognized as a beneficial use of water (WS 41-3-1001(a)). That is, instream flows may be appropriated only for the purposes of improving or maintaining existing fisheries (WS 41-3-1001(b)). Waters used for the purpose of providing instream flows for fisheries shall be the minimum flow necessary to improve or maintain fisheries (WS 41-3-1001(c)(d)).

Only the State of Wyoming may acquire appropriative rights for instream flow purposes (WS 41-3-1002). While the State may appropriate water either on a direct (instream) flow basis or for the storage and release of water for instream flow purposes, it is also authorized to acquire existing water rights by voluntary transfer or gift for the purpose of instream flow uses (WS 41-3-1007). To emphasize the "voluntary" nature of such acquisitions, the law specifically denies any power of condemnation to the State Game and Fish Commission of the purchase of existing rights for instream flow purposes (WS 41-3-1009). The law also prohibits the beneficiary of instream flow rights to file for abandonment against another appropriator (WS 41-3-1011).

No single agency is responsible for the administration of the State's instream flow program. Several agencies are involved in the process of appropriating water rights for instream flow uses. To initiate the instream flow process, the Wyoming Game and Fish Commission performs a series of studies to identify the most critical stream segments and to estimate the minimum flows necessary to protect the fisheries (WS 41-3-1003). Once a year, Game and Fish may present a list of critical stream segments to the Water Development Commission.

Once the Water Development Commission receives the list from the Game and Fish Department, it then files a permit application with the State Engineer's office for every stream segment on the list (WS 41-3-1003(c)). After the

Water Development Commission applies for the permits, it must begin its own studies on how to provide for the instream flows if the State Engineer decides to grant the permits. To this end, it prepares a feasibility study for each of the stream segments to determine if natural flow is available to provide water for the instream flow, and whether the water for instream flows should come from existing or new dams or reservoirs, or from unappropriated direct flows (WS 41-3-1004).

In the event the Commission finds that storage water is necessary to provide for the instream flow, it conducts a study of a reservoir project similar to other reservoir project studies, and must report to the Wyoming Legislature for project authorization. When it completes the feasibility studies, the Water Development Commission presents its findings and recommendations to the legislature and the Game and Fish Commission (WS 41-3-1004(b)).

The legislature and the Water Development Commission only have the power to authorize instream flow appropriations where such appropriations would require the building of a storage facility. If a storage facility is required to provide the recommended instream flows, the Water Development Commission has the discretion to decide if such a request should be made to the legislature. If the authorization is requested, the legislature may use its financial power to support instream flow storage projects.

While the legislature and the Water Development Commission have the power to authorize some instream flow appropriations (instream flow proposals that involve only natural flow do not have to go before the legislature), only the State Engineer has the power to grant water use permits for instream flows--permits that actually create instream flow rights. Since the instream flow program is designed to incorporate the appropriation of instream flows into the rest of Wyoming's water law, the State must apply for a permit with the State Engineer, just like every other water appropriator. The State Engineer must grant a permit unless it is against the "public interest." To ensure that the State Engineer decides correctly on whether the instream flow permit is in the public interest, the act authorizes the State Engineer to evaluate the proposed instream flow and the necessary amount of water to maintain existing fisheries and fisheries habitat when necessary (WS 41-3-1006(e)).

Once the State Engineer completes his evaluative studies, if any, he must hold a public hearing for each instream flow application (WS 41-3-1006(e)). The Water Development Commission is required to publish a notice of the application and hearing in a newspaper of general circulation in the area of the proposed instream flow appropriation (WS 41-3-1006(d)). At the public hearing, the Game and Fish Commission must present its studies and other interested parties present their views on the instream flow application. The State Engineer may "condition" the permit by requiring further review on the continuation of the permit, and by specifying the limits and operational characteristics of the permit.

If an instream flow is provided on a stream where there is competition with other consumptive flow water rights, or with the delivery of reservoir water in the stream, appropriate measuring devices are installed on the

instream flow segment and on diversions from the stream in order to monitor the instream water rights. The Game and Fish Commission is required to report to the Water Development Commission the need to regulate a stream to protect the priority of an instream flow right. The report is to contain information establishing present or future damage to the fishery in the event that the stream is not regulated. The water division is required to forward the report to the State Engineer who will regulate the stream only if present or future injury to the fishery has been shown, if the call for regulation is not a futile call, or if the call will not impair senior water rights (WS 41-3-1008).

As of November 1987, Wyoming's instream flow program consists of four stream segments (all pending approval), with a total of 32.15 miles, or less than 1% of the total perennial stream miles in the State. The total quantity of water applied for under these instream flow applications is 2,170 cfs per year, or about 2% of the total water use in the State (Trelease 1987).

APPENDIX B

SURVEY OF INSTREAM FLOW ISSUES IN NORTH AMERICA

Dudley W. Reiser and Thomas A. Wesche, Co-Chairmen
Water Development and Streamflow Committee
Western Division of the American Fisheries Society

Increases in the number of proposed water development projects in North America have forced fisheries biologists to predict the level of impacts resulting from such projects. Undoubtedly, the impact of greatest concern is linked with the regulation and perhaps reduction of natural flows in the system (Peters 1982).

In 1976, the Western Division of the American Fisheries Society (WDAFS) sponsored a Symposium and Specialty Conference on Instream Flows to provide a forum and a published proceedings (Orsborn and Allman 1976) for reference by individuals involved in water resource allocation. Today, although there is general agreement among various State and Federal resource agencies that "instream flow" needs for fisheries should be a recognized use of water, disparity remains as to how instream flows are legally perceived or derived. In addition, because of geographic differences, instream flow problems will vary by region and with species composition of fish (Peters 1982).

In 1981, the Water Development and Streamflow Committee (WDASC) of WDAFS surveyed the western United States, and portions of Canada and Mexico to provide an overview of instream flow procedures and programs, and an assessment of their effectiveness for providing flows to sustain fishery resources. The WDASC repeated and expanded the survey in 1986 to include all of North America.

SURVEY FORMAT

The 1986 survey was completed by mail using a questionnaire patterned after a form used in the earlier 1981 survey of the western United States.

The questionnaire solicited information under seven major headings including:

- status, title, and effectiveness of current instream flow legislation;
- name of agency (or agencies) that administers instream flow activities;
- listing of methods used for assessing instream flow needs;

- basis for selecting a given method;
- description of how field results are used in formulating an instream flow recommendation;
- discussion of major instream flow related research needs;
- other concerns related to instream flows.

The questionnaires were sent to each agency in the 50 States and 12 Canadian Provinces responsible for administering fish and wildlife resources, and in some instances water resources. A total of 202 questionnaires were sent to 186 agencies within the U.S. and 16 in Canada. For many States, questionnaires were also sent to the Federal agency administering Federal regulations in that area (e.g., U.S. Fish and Wildlife Service).

Responses were received on 100 of the 202 questionnaires, representing a 49.5% return rate. All States except Connecticut, Iowa, Maryland, and the District of Columbia responded. Nonresponding Canadian Provinces or Territories include Prince Edward Island, Quebec, Saskatchewan, and the Yukon Territory. The detailed responses for each State or Province follow.

Appendix B. American Fisheries Society IFIM questionnaire.

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
ALABAMA				
Alabama presently has no instream flow legislation nor is there any proposed or expected in the near future. Water quality management is not yet perceived by the public as a critical issue.	FERC administers IFIM activities on private but federally licensed facilities. The COE administers IFIM activities on their federal projects.	IFIM, AVDEPTH Sub-routine (Wetted Perimeter Analysis), Tennant, fixed percentage of mean annual flow.	Size of project, time, money, resource value, complexity of project.	Results are used to develop a range of management levels. Results are generally used as a negotiating tool.
ALASKA				
Few applications have been made due to regulations requiring documentation. State DNR is in the process of relaxing regulations to allow filing for permit (notice of intent to study) to secure data and allow a given period to complete the study and submit documentation.	AK Dept. of Natural Resources (DNR) (same as most western states), Division of Land and Water Management. C. Estes, ADFG, is statewide IFIM coordinator.	FWS IFIM has been on at least 8 streams.	Degree of conflict anticipated (rigorous challenge or negotiations?) and budget restraints.	Data analyzed to produce comparable output for an array of possible flow requirements (flows of interest and flows that reveal sensitivity to change). Then negotiation is usually involved to establish the reasonable flow.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
ALASKA (concluded)				
Enacted.	AK DNR is responsible for administering water rights including reservations of water. Primary contact is Director, Division of Land and Water Management, DNR's Division of Geophysical Surveys is the state's hydrologic data collection agency. AKFG is developing an instream flow program.	No single method is specified. Most methods used to date have been the IFIM or Tennant.	1. Degree of competition. 2. Amount and type of existing data. 3. Type of instream use. 4. Cost.	
Only one application accepted to date and it is pending - Terror River.	AK DNR. Mary Lu Harle.	Tennant, FWS IFIM plus any other method that can be documented as being a valid approach.	Availability of hydro and biological data, availability of financial and personal resources, amount of controversy with the site.	Data are analyzed to determine the worth of various flow scenarios from which negotiations are based.
ARIZONA				
Legislation was developed for 1986 legislative session, however, it was not introduced. The bill was developed by AZ Game and Fish Dept. but sufficient support for passage could not be obtained.	AZ Dept. of Water Resources. Currently the position for primary contact is vacant.	IFIM applied to studies on the Verde River drainage relative to water exchanges through the Central Arizona Project authorization.	Legal acceptability and utility.	Studies have not yet been completed.
Legislation was developed for the 1986 legislative session. However, enough support could not be generated to insure passage.	AZ Dept. of Natural Resources.	IFIM.	Reliability of data/ acceptance within litigation.	They form the basis for all such recommendations.
(Continued)				

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
ARIZONA (concluded)				
Conservation organizations determined it would be wiser to regroup for the next legislative session.				
Water may be appropriated for wildlife including fish. However, these appropriations are junior since AZ's streams are already heavily allocated.	BR in project impact evaluations, must receive an FWS Coordination Act report. Also coordinate with AZ Game and Fish. Contact: FWS - Paul Barrett, AGF - Jim Burton.	IFIM.	BR depends on FWS for leadership in IFIM studies.	To date, IFIM studies have not met with much success for varying reasons. Hopefully, study results will be the basis for making instream flow recommendations.
ARKANSAS				
State Act 1051 directed the Arkansas Soil and Water Commission (ASWCC) to update state water plan, identify and evaluate state groundwater and surface water problems, and present specific recommendations to meet future water needs. This includes instream flow needs for fisheries. Title	ASWCC has the power to curtail water usage from a stream in drought conditions but has not done so to date.	Arkansas Method (a discharge method) has been employed for making instream flow reservations (56 streams were filed on in 1986). AG&F is also conducting pilot IFIM study on the L'Anguille River.	Time and manpower limitations and applicability to Arkansas.	USGS flow-discharge data, knowledge and sampling of major physiographic regions of the state, and fish population data base are combined to formulate instream flow recommendations.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
<p>ARKANSAS (concluded)</p> <p>of ACT - An act to establish a mechanism to determine the requirements of the water users of Arkansas; and for other purposes.</p> <p>CALIFORNIA</p>				
AB387, which was the proposed instream flow bill in 1983, did not pass legislation. Plans were made to reintroduce the bill in 1984; unaware of the status of the bill at this time.	<p>1. CDF&G is the lead agency performing studies and reviewing project data.</p> <p>2. DWR reviews projects and coordinates with the agencies.</p> <p>3. FWS performs studies and reviews projects.</p> <p>4. USFS performs some studies and reviews others.</p> <p>CDF&G - Bob Traenor, Region 11, Rancho Cordova, CA; Jim Schaeffer, Central Office, Sacramento, CA; David Hoopaugh, Region 1, Redding, CA; USFWS - Tom Richardson, Sacramento Ecological Services Office; NMFS - Roger Wolcott, Tiburon, CA.</p>	<p>Primarily use IFIM. Have also employed the USFS R-2 Cross method. Also involved in some flushing flow studies.</p>	<p>IFIM is required by CDF&G. Other methods selected based on critical habitat under consideration.</p>	<p>Output from PHABSIM are combined by life stage with the hydrology data. Critical flows for spawning and rearing habitat etc., are determined for different species and life stages.</p>
	<p>Most agencies request the use of the IFG-4 method for evaluating instream flow issues in the state.</p>	<p>Policy and the accuracy of the FWS methods.</p>	<p>Typically, the optimum flows from the instream flow analysis are requested. There is then generally a period of negotiation for the flow that is finally adopted as the required value.</p>	

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
CALIFORNIA (concluded)				
Legislation stipulates that the owners of hydroelectric projects or other water developments must release sufficient water to maintain fish populations in good condition.	The State Water Resources Control Board administers instream flow activities through their Division of Water Rights. CDF&G is responsible for identifying and quantifying the instream flow needs for the aquatic resources in the state.	CDF&G primarily uses IFIM for field assessments. However, other less expensive methods may be used on small water diversions.	The ability to predict changes in fish habitat with changes in flow. CDF&G would like to have the ability to predict changes in fish production and population structure.	Results are used to establish flow recommendations that best maintain pre-project conditions. CDF&G generally takes a conservative approach, but allows for revision upon review of additional data and information.
COLORADO				
Senate Bill 97 was passed in 1973 with additional legislation passed in 1981.	Colorado Water Conservation Board is generally regarded as the state's water planning agency. Recommendations on appropriate instream flows are made to CWCB by Colorado Division of Wildlife.	Use the USFS R-2 Cross Sag Tape method to establish minimum flow standards under SB-97. In select cases, the IFG-4 analysis is used as a foundation for mitigation. Time and expense limit use of IFIM.	Nature of the problem. To establish minimum flows, we use a time and cost efficient method (R-2 Cross). To establish habitat-flow relationship, we use the IFIM method.	Field notes are entered into computer model to derive hydrologic characteristics of channels. Three main criteria are used to derive minimum flow recommendation: 1. mean depth equal to .2 ft or 1% of stream top-width; 2. mean velocity equal to 1 fps; and 3. wetted perimeter equal to 50% or greater.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
DELAWARE				
FLORIDA				
None. A number of Florida statutes deal with water withdrawals, water quantities, etc., in a piece-meal fashion. The interpretation of these rules is very uncertain. No Florida law addresses instream flow needs per se. Most laws simply require "enough" water be supplied to meet the needs of fish and wildlife.	<ol style="list-style-type: none"> 1. FL Game and Freshwater Fish Commission. 2. FL Dept. of Natural Resources. 3. FL Dept. of Environmental Regulation. 4. NW Florida Water Management District. 5. South Florida Water Management District. 6. Suwannee River Water Management District. 7. St. John's River Management District. 8. SW Florida Water Management District. 9. U.S. Army Corps of Engineers. 	<p>Evaluate water quality standards with respect to streamflows.</p> <p>Standard techniques lacking. IF needs addressed on local basis, e.g., the needs of the St. Johns River concern loss of water from headwater marshes. Everglades concern with water levels.</p>	<p>Standard methods not adaptable to Florida. Aquatic systems of north, south, and central Florida are very different. Methods used may be based on theory, some based on water budgets for the system.</p> <p>Can only be answered on a case-by-case basis. For example, studies have shown that channelization of the Kissimmee River in south Florida has been detrimental to fish and wildlife by altering annual hydroperiods. Experiments are now being conducted to see if hydroperiods can be returned to semi-normal schedules by regulating pools within the existing canal.</p>	
GEORGIA				
See Opportunities to Protect Instream Flows in Georgia, published by USFWS.	Georgia Environmental Protection Division, Dept. Natural Resources; Water Resources Management Branch (Chris White, Branch Chief).	7Q10. Have used PHABSIM.	Importance of the resource and whether or not flows are likely to be limiting.	Interagency exchange of information and data.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
HAWAII				
Enacted only for Koolauloa and Koolaupoko Districts of Oahu Island (Hawaii Instream Flow Use Protection Act of 1982).	Dept. of Land and Natural Resources, Division of Water and Land Development administers the Hawaii Instream Use Protection Act for Windward Oahu (Manabu Tagomori, Manager Chief Engineer). The U.S. Army Corps of Engineers also sets instream flow standards for projects requiring Section 404 permits.	Instream flows have been determined by the developer or agency. These have not incorporated biological requirements for native fauna. USFWS is testing the IFIM in Hawaiian streams.	USFWS is recommending the IFIM to the state and Corps since it incorporates the micro-habitat requirements of native stream fauna, and provides for the best available means of determining changes in river hydraulics with and without water developments.	Currently, field inspections and existing discharge data are used to determine a "scientific best guess."
IDAHO				
	Idaho Dept. of Water Resources serves as the administrator of water rights; Idaho Dept. of Fish and Game collects the field data and makes the recommendation of an instream flow.	Dependent on the stream. Have primarily used IFIM and the "Wetted Perimeter" method.	Based on time and money availability.	Using the IDF&G's guidelines, a stream flow is selected and then negotiations between entities eventually determine the flow.
ILLINOIS				
In the Kaskaskia River Basin, the Division of Water Resources has the authority to set minimum flows as well as on certain other	Division of Water Resources, Dept. of Transportation has the authority to set levels on many streams and is presently contracting instream flow studies to determine what IF	IFIM.	Selected IFIM since it provides a measure of fish habitat values and utilizes PHABSIM.	Weighted useable area values as computed from PHABSIM are reviewed by fisheries biologists who then make recommendations for flow levels.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
ILLINOIS (concluded)				
"public" streams. The laws for this are ambiguous and contain no set standards stating what minimum flow should be or how it should be determined.	levels should be. The contact at DOWR is Gary Clarke.			
INDIANA				
None. However, the Indiana Fish and Wildlife Code, Section 5-9 relates to dams on streams and requires releases equal to inflow to downstream areas during periods of minimum flow. The Indiana Stream Pollution Control Board monitors water quality.	Instream flow activities as such do not exist. In specific FERC projects instream flow studies have been requested of the applicants for licenses or the holder of a Preliminary Permit (USFWS, Indiana Division of Fish & Wildlife, Indiana Stream Pollution Control Board, Indiana Division of Water, EPA, FERC coordinators). However, none have been completed to date.	No formal studies completed to date. The only specific work has been with the use of the Tennant Method to develop minimum acceptable flows on some projects.	Tennant Method selected because the FERC had not provided sufficient information so the state and federal agencies could properly analyze a given project's effects. The applicant had adamantly held to flows that would clearly degrade the stream fishery value.	The stream fishery value was defined and the Tennant Method applied to hopefully sustain the same quality. The state is considering use of IFIM in future flow appropriations.
	Natural Resource Commission of the Indiana Dept. of Natural Resources. The Division of Water will provide technical input in consultation with the Division of Fish and Wildlife. Contacts: Thomas Bruns, Assistant Director, Division of Water; Ed Hansen, Director, Division of Fish and Wildlife.	Will consider using IFIM, WSP, and the Tennant methods.	Haven't reached a point of establishing criteria for selection of a methodology. The final decision will be made by the Natural Resources Commission.	

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
KANSAS				
	<p>Chief Engineer, Division of Water Resources, State Board of Agriculture is responsible for administering minimum desirable streamflows. He receives advice from the Kansas Water Office, the principle water planning agency (David Pope). Joseph Harkins, Director, Kansas Water Office; Tom Stiles, principle IF staff member, Kansas Office.</p>	<p>IFIM was used early-on. Results have been used to support current techniques to assess fisheries habitat availability at varying flows based on standing crop data and historical flows.</p>	<p>Must be performable within constraints of manpower, budget, and instream flow planning schedules. It must yield some predictive capability to judge responses of fish population to varying flow regimes. It must have potential for broad application to meet schedules and the need for consistent policy on how much flow to recommend.</p>	<p>Standing crop data from 450 streams have been analyzed against physical and hydrological observations in developing relationships of suitability. These relationships (suitability indices) are compared to calculated widths, depths and velocities at different exceedence flows to predict impacts of different future flow regimes to fisheries. Earlier IFIM results were used to help set policy on how much proportional flow to recommend.</p>
KENTUCKY				
<p>There is no grass-roots effort to enact such legislation. Also, there have been no projects constructed that would endanger low flows in any streams.</p>	<p>The activities would be handled by the Division of Water, Natural Resources and Environmental Protection cabinet, separate from our agencies. The activities dealing with instream flows would be handled either through the 401 water quality certification or Kentucky Pollution Discharge Elimination System programs. The Director of DOW would be the prime contact.</p>	<p>Generally use professional judgment, although the Tennant method has been used.</p>	<p>Professional knowledge and familiarity with the project.</p>	<p>Recommendations are developed to dictate low flow augmentation.</p>

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
KENTUCKY (concluded)				
Legislation for water withdrawals has been enacted for commercial use, but agriculture has been excluded. Additional legislation is pending and in development for the protection of downstream users and aquatic life.	Kentucky Division of Water: David Lee--water withdrawals, Bob Logan--low flow impacts to aquatic life.		No set method is currently being applied in Kentucky.	
LOUISIANA				
None known. Lack of legislation is probably based on a large surplus of surface water.		We work the coastal region where there is virtually no need to assess instream flow needs. There are few, if any, reservoirs that alter downstream flows in the work area.		
MAINE				
No specific legislation mandating instream flows. However, flows are considered and may be set, case-by-case under several state statutes (Hydropower Act, Stream Alteration Act, Great Ponds Act,	Dept. of Environmental Protection (hydropower, stream alteration, great ponds, abandoned and neglected dams, waste discharge), contact: Dana Murch. Dept. of Inland Fisheries and Wildlife (Fishways and Dams Act), contact: Peter Bourque. Dept. of Marine Resources (Fishways and Dams Act), contact: Lewis Flagg.	Use HEP and IFIM as developed by USEFS for larger hydropower projects. Use modifications of these for smaller projects.	Acceptability by the FERC, state licensing agencies, development community and other fish and wildlife agencies as being the best method available at this time (IFIM and HEP).	Negotiated directly with the developer, or via permitting/licensing agency.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
MAINE (concluded)				
Fishways and Dams Act, Abandoned and Neglected Dams Act).				
MASSACHUSETTS				
Various acts address instream flows in general terms such as reasonable minimum flow, safe yield of the system and legislative approval for withdrawal. One such act authorizes the Springfield Water Supply at Littleville to release a 5 cfs minimum flow.	<ol style="list-style-type: none"> 1. MA Water Resources Commission--Elizabeth Kline. 2. USFWS, Ecological Services--Gordon Russel. 3. MA Division of Fisheries and Wildlife for Hydro--Robert Madore. 	Massachusetts Balance, the Aquatic Baseflow and the 7Q10.	<ol style="list-style-type: none"> 1. Accepted engineering technique. 2. Minimum fisheries protection. 3. Water quality standards. 	Used as the basis for approval or denial. If a project is not accepted because of a single issue, these data become the basis for the negotiation.
MICHIGAN				
None proposed.	<p>USGS and USFWS (Robert Seppala); Michigan Dept. of Natural Resources - Fishies (Tom Doyle); MDNR Surface Water Quality Division (Red Evens); MDNR Geological Survey; MDNR Environmental Enforcement. Activities of the above include benthic surveys, fish and water quality surveys, flow measurements.</p>	7Q10, also make estimates by observing several different flows.	Lack of time and funds for more in-depth studies. Lack of training. Type of study also depends on how much cooperation received from developers and how easy it is for developers to provide the information.	Used by resource agencies to develop recommendations.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
MICHIGAN (concluded)				
None. Michigan is a Riparian Doctrine State, which by common law is regulated by "reasonable use."	Difficult to determine because Michigan is a riparian water rights state. Normally this would be administered by MDNR and the State Water Resources Commission within MDNR.	Wetted Perimeter, velocity and habitat type protection method is similar to IFIM but simpler.	Method must be "quick and dirty," i.e., capable of deriving a recommendation with a minimum of manpower, regulation, and time.	When a point is reached where increased flows will not significantly increase wetted perimeter, habitat for fish or fish food organisms, or velocity for water quality or spawning, then it is believed that the minimum protection for aquatic life has been reached.
MINNESOTA				
	MDNR Division of Waters; water appropriation permits, review FERC applications for hydropower development, changes in operating plans of dams. Hedia Adelsman and Patricia Olson, Division of Water; Joseph Geis, Ecological Services Section.	MDNR is currently reviewing a number of methods to determine which are most appropriate for use on Minnesota streams and rivers.		
MISSISSIPPI				
None. It has been attempted for several years and always died in the House or Senate Committees.	Bureau of Pollution Control - Charles Chisolm.	The Waterways Experiment Station at Vicksburg has used IFIM for planning purposes within the Corps of Engineers.	Personal preference, ease of implementation, and what results are expected from the study.	

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
MISSISSIPPI (concluded)				
	U.S. Army Corps of Engineers, four districts--Memphis, Mobile, and Nashville for flow issues; Mississippi Dept. of Wildlife and Fisheries for fishery needs; Mississippi Bureau of Pollution for water quality.	Standard limnological, hydrological and fisheries methodologies.	Prior data collection.	
MISSOURI				
Pending water allocation legislation introduced in current session for first time.	If legislation is passed, DNR is proposed to administer instream flows.	Members of DNR have attended short-courses in Fort Collins, CO.	None selected yet.	Department of Conservation makes the recommendations.
Missouri has appeared to accept riparian rights by default. There are rumors that water laws may be enacted within 3-5 years.	DNR first; MO Dept. of Conservation second.	WSP (IFG-2) and IFG-4 programs from USFWS.	Determination of study goals and applicability of each methodology.	By direct reference to available habitat and species. Our policy is to conserve habitat by impact avoidance. If that is not possible, by habitat replacement and enhancement.
A bill relating to Missouri water use has been introduced (H.B. 1470), which states in part that during critical water years	MO Dept. of Conservation has been the contact for impacts to fish and wildlife (Planning section 314-751-4115). DNR, Division of Geology and Land Survey has maintained an interest in overall water use (Don Hammer).	IFIM, Montana method, and experience.	Time, money, and the nature of the demand on the resource.	Establishing low flow requirements, establishing critical reach or spawning flow regimes, etc.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
MISSOURI (concluded)				
there must be an equitable use of water for a variety of beneficial uses, including fish and wildlife.				
MONTANA				
The 1973 Water Use Act allows the appropriation of water for instream flow use by public entities.	Dept. of Fish, Wildlife, and Parks - Larry Peterman, Dept. of Natural Resources - Gerhard Knudsen.	Varies with the stream, fishery, etc. Contact Larry Peterman.	Contact Larry Peterman.	Contact Larry Peterman.
	Fish, Wildlife, and Parks, contact Larry Peterman and Fred Nelson.	Primarily the Wetted Perimeter Method.	1. Consistency with state policy. 2. Hydrological conditions. 3. Special project requirements.	Field studies generate basic data from which instream flow recommendations are made and supported.
Water Use Act of 1973 and Murphy Right Act of 1969.	Montana Dept. of Fish, Wildlife, and Parks--request, quantifies and administers rights and reservations (contact: Larry Peterman and Fred Nelson); Dept. of Natural Resources and Conservation--reviews reservation applications; Board of Natural Resources and Conservation--grants reservations; Montana Water Court--grants pre-1973 instream water rights.	Primary method is the wetted perimeter/inflexion point. However, other methods are acceptable and used on occasion.	Provide reasonable and defensible recommendations, relatively simple to use, based on stream specific habitat discharge relationship, and is time and cost effective.	Method generates a range of recommendations and the specific recommendation is selected based on an evaluation of the quality of the existing stream resource.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
NEBRASKA				
	Instream flow applications can only be filed by Natural Resources Districts or the NE Game and Parks Commission. Applications are filed with this department. Larry Hutchinson is the contact with the NE Game and Parks Commission. J. Michael Jess, Director, Department of Water Resources will make determination on approval or denial of the applications.			
	1. The Natural Resource Districts (24) and/or the NE Game and Parks Commission identify specific stream segments they consider to have a critical need for instream flows. 2. The Natural Resource Commission files the application. 3. The Director of Water Resources grants the permit.			
NEVADA				
Hasn't been introduced or even considered.	State Water Engineer Office; Nevada Dept. of Wildlife.		Results and need.	

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
NEW HAMPSHIRE				
Although a select committee pre-compared legislation based on state-wide study, the legislature has failed to pass it into law.	As far as applications to the FERC are concerned, both the NH Fish and Game and USFWS recommend or impose flows. FERC has authority over administration of the flow. The NH Water Resources Board administers instream flow activities of dams they own.	Rely on the Aquatic Base Flow Policy developed by USFWS. Field methods include IFIM and others in some cases.	Length of the by-pass reach, value of the fishery, type of population, resident vs. anadromous species, and type of project.	NH Fish and Game bases recommendations on FERC applications on results of flow studies or IFIMs.
There is no federal legislation specifically governing stream-flows in New England. However, certain laws such as the USFWS Coordination Act, NEPA, and Federal Power Act, allow for requiring various mitigation measures including flows at water development projects.		Historical streamflow records, site-specific physical and biological data, and streamflow habitat simulations--IFIM and HEC-2.	Scope of the development project and importance of affected resources usually determines how sophisticated a method is used.	Review field data results and make recommendations if the data are adequate. If a consultant performs the work for a project developer, we don't necessarily agree with the consultant's recommended flow.
NEW JERSEY				
None. It appears that human needs have more importance than environmental needs, despite this agency's attempts to alter. We are constantly disagreeing with	Water diversions are overseen by the Bureau of Water Allocation in the Division of Water Resources in the Dept. of Environmental Protection. The Division of Fish, Game, and Wildlife has input into water diversion reviews. However,	For water allocation, 7Q10. This division uses the Montana Method (30-60% of mean annual flow) or the New England method (0.5 or 1.0 cfs depending on resource). Both methods mimic each other in NJ.	The objective is to maintain the existing biota. The best description of the flow on which the biota has been maintained is the modal daily flow (MDF). We select the alternative that best	In general, field studies are not performed to determine instream flow.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
NEW JERSEY (concluded)				
the State's Water Use Agency over what the "conservation" flows should be.	human needs tend to overshadow ecological considerations.		approximates this with the realization that the MDF is somewhat higher than what is available for IF after diversion.	
Protection comes under NJ Division of Water.	NJ Dept. of Environmental Protection, Division of Water Resources.	Montana method with possible variations if developer does stream flow profile study.	Best available for use at the time.	If profile study shows little dewatering in the river, then may accept less than the 30% or 60% average annual flows originally asked for.
NEW MEXICO				
Fish and wildlife are not considered a beneficial use of instream flow in New Mexico.	State Water Engineer, Steve Reynolds.	None. USFWS-ES uses IFG when required.	Experience and training of the individual who will use the system.	Used as a method of determining mitigation flows related to federal water projects.
None. There has been at least one other effort in the past to implement IF legislation but it failed. It was considered a waste of water, i.e., if it can't be put to consumptive use than why bother. Water issues are quite powerful in the state.		IFG methods have been used in several instances to maintain flows for trout fisheries.	At the present time there is no systematic approach to assessing instream flow needs.	Microhabitat studies have been used to characterize habitat needs in relation to various flows (different seasons and geographic areas).

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
NEW MEXICO (concluded)				
Difficulty in drafting legislation that would have "real benefit." Cowboys have problems with it.				
NEW YORK				
In 1976, legislation was enacted that gave authority to NY Dept. of Env. Cons. to regulate 31 reservoirs in 7 southeastern counties such that "the volume and rate of change of volume of such releases can be regulated to protect and enhance the recreational uses of waters affected by such releases while ensuring and without impairing an adequate supply of water for power production or for any municipality that uses water from such a reservoir for drinking or other purposes."	NY Dept. of Env. Cons.; Division of Fish and Wildlife--Douglas Sheppard; Aquatic Resources, William Lee and Al Bromber; Water Supply and Quality, Division of Regulatory Affairs--Murdock Mackenzie; Hydropower Licensing, NY Dept. of Health, Division of Environmental Protection--Leo Hetling; Water Supply.	Flow duration curves and other hydro data, watershed characteristics, water quality data are integrated with future fish and wildlife concerns. Field methods range from recon. to an IFG-type assessment.	Basis for selection depends on fish and wildlife management objectives; potential adverse environmental impacts; available funding; regulatory authority and project complexity.	Results are examined from management objectives (fish and wildlife, water quality, etc.) and then a recommendation for instream flow formulated that is consistent with physical, environmental, economic, and social concerns from both a site specific and basin-wide standpoint.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
NEW YORK (concluded)				
Have none and there is nothing on the federal level that would apply here. We issue instream flows through comments to FERC. These have proven effective, especially on exemptions.	USFWS covers the state on federal issues. For the state, contact Murdock Mackenzie of the NY Dept. of Env. Cons.	IFIM has been used and continues to be. Simply "eyeballing" has been successfully used where all parties agree. Non-field methods have also been used such as calculations using flow data.	Size and significance of stream and resources involved. Negotiations among parties involved.	Results are often presented by consultant for power companies. Recommendations must be extracted from these and other data. Sometimes agreement can be negotiated before FERC is involved.
NORTH CAROLINA				
Water Use Act of 1967 is concerned with providing and maintaining conditions that are conducive to the development and use of water resources. Section G.S. 113-421 of the policy provides for the maintenance of some of the rivers in a free-flowing state and provides for the protection of water quality and adjacent lands by retaining the natural and scenic conditions. The policy states that the preservation of such rivers or segments of rivers constitutes a beneficial use for public purposes.	Division of Water Resources, NRCD--Steve Reed; Ecological Services, USFWS--Ries Collier; North Carolina Wildlife Resources Commission--Don Baker (as it relates to or affects fish and wildlife resources - through DWR and NRCD). 1. NC Dept. of Natural Resources and Community Development. 2. Division of Wildlife Resources concerns itself with flows sufficient to maintain fish habitat, water intake supplies, and recreational needs. 3. Division of Environmental Management seeks to maintain pollution dilution flows adequate to meet state standards for BOD.	IFIM, wetted perimeter, September median.	Characteristics of the stream. The September median flow recommendation in situations where project sponsor chooses not to conduct approved study.	Standard study procedural guidelines determine flow recommendation.
		Wetted perimeter, IFIM (IFG-2 and IFG-4).	Importance of resource (ecologically, recreationally, politically) and character of the stream (degree of fall, substrate).	Usually determine an annual minimum flow adequate to sustain survival fish habitat.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
NORTH DAKOTA				
North Dakota law (Chapter 61-04) indicates that a water permit can be secured only for beneficial uses in connection with constructed works. It is not possible to secure a water permit for instream flow for fish and wildlife. Instream flow values are recognized in the permit process, which requires the state engineer to determine whether a water permit is in the public interest. Instream flow values rank 6th behind domestic, municipal, livestock, irrigation, and industrial use in determining if it is in the public interest.	ND State Water Commission administers issuance of water use permits. ND Game and Fish Dept. administers the fishery program; USFWS.	ND Water Commission recognizes the Tennant/Montana method. Therefore, 10% of the average annual flow of any stream would satisfy the minimum criterion.		
Extremely low priority project within the state, especially at the State Water Commission, which is the agency responsible for management of surface waters.	State Water Commission, Vern Fahy (state water engineer and head of the SWC).			

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
OKLAHOMA				
Conservation groups and agencies were unable to adequately stimulate legislative interest to date.	If enacted it would be Oklahoma Water Resources Board, James Barnett, Executive Director.			
Oklahoma's state government has a history of, and is still promoting, industrial and agricultural development. The state is concerned with the environment, but any legislation such as land use planning or instream flow is difficult to pass.	Oklahoma Water Resources Board determines and administers water rights, encourages conservation and development of water resources, coordinates local, state, and federal water activities, and establishes and administers water quality standards. The Stream Section of the Board is the primary contact.	IFIM and the Montana methods.	Information desired and the time and money involved and available.	Used to recommend flows that would provide the maximum usable area for the species of concern at the appropriate time of year.
OREGON				
ORS 536.310 enacted in 1955 states purposes and policies to be considered in formulating state water resources program; ORS 536.325 passed in 1985 established minimum flows by board; application by minimum flow by state agency,	Water Resources Commission establishes minimum flow requirements (Tom Kline, Policy and Planning Division, Water Resources Department). Department of Fish and Wildlife determines minimum flow requirements for aquatic life (Louis Fredd, Environmental Management Section). Department of Environmental Quality determines minimum flow	IFIM and versions, and the Oregon method.	Cost may dictate using a method other than IFIM. The Oregon Method was used to develop numerous minimum flow recommendations for state water resource planning. These were completed prior to 1975. In general, we recommend the use of the IFIM even where it may be marginally	Collaborate with federal fish and wildlife agencies to evaluate IFIM field study data and computer generated habitat vs. Q relations.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
OREGON (concluded)				
With the board acting on the application.	requirements for pollution abatement. Strategic Water Management Group is a multi-agency coordinator of water resources management objectives (Darrell Learn, Policy and Planning Division, Water Resources Department).		appropriate to do so. The IFM tends to be uncritically accepted by diverse groups.	
PENNSYLVANIA				
Instream flow regulated by the policy set down by the PA Fish Commission and PA Dept. of Env. Res.	PA Dept. of Environmental Resources, PA Fish Commission, and USFWS administer instream flow.	The PA Fish Commission has a minimum flow policy, while the PA Dept. of Env. Res. follows the Q7-10. The USFWS uses the 30% of the average daily flow.	Selection of a given method is the agency's decision.	
The PA Dept. of Env. Res. established the Q7-10 as minimum flow for fish and wildlife. They also use the 0.25 cfs for ungaged streams.	The PA Dept. of Water Resources, Water Quality Section - Edward Brezina, Chief.	Sometimes a temporary stream gage is used, often the 0.25 cfs formula is applied without field review. Occasionally on COE dams, they will alter flows and observe changes.	Availability of stream-flow data.	
RHODE ISLAND				
Instream flow issues existing in the western states do not occur in Rhode Island. The only basis for any issue might be limited to small scale hydro				

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
RHODE ISLAND (concluded)				
and future reservoir construction. Our current wetlands and dam legislation allows us to control instream flow activities.				
SOUTH DAKOTA				
No instream flow legislation is currently on the books. Attempts are being made to administratively have instream flows recognized as valid uses of surface water without going into the legislative process. Current laws imply instream flows are valid but differing viewpoints of the water rights agency and FG&P have not been solidified into a state agency opinion.	SD Dept. of Game, Fish, and Parks - Ronald Koth, Ronald Glover. SD Dept. of Water and Natural Resources - John Hatch, Chief Engineer (water rights); Richard Hanson (water quality).	IFIM, sag tape for cursory surveys, passage flows or minimum flows needed for specific recreational activities.	Acceptance by engineering, biological, and administrative community and the specific situation.	Study results are used in conjunction with historical flow measurement to determine and justify base-line maintenance flow regimes.
Instream flows are regarded in the same manner as other water	Department of Water and Natural Resources, Quality Division of Water, Department - Rich Hanson; Department of Game, Fish, and Parks - Ron Koth.	Usually the USFWS method of instream flow analysis, IFG-2 and IFG-4.	The most current "state of the art" technique. Particular stream conditions will determine the methodology.	They are incorporated into the instream flow methodology to predict fish habitat.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
SOUTH DAKOTA (concluded)				
use. An application for a permit is presented to the State Water Management Board. The Board considers four items: (1) availability of the water, (2) impact on existing rights, (3) public interest, and (4) beneficial use.				
TENNESSEE				
This legislation is related to instream flow legislation, not specifically targeted to it.	Tennessee Valley Authority, Department of Health and Environment, and Tennessee Wildlife Resources Agency. Office of Water Management: 1. Division of Water Pollution Control, Natural Resources Section - Larry Bowers. 2. Division of Water Pollution Control has minimum flow requirements below TVA dams, also, to provide for the simulation for downstream discharges and for aquatic life.	USFWS instream methods, plus visual assessment based on controlled tailwater releases. The USFWS's IFIM was used by the TVA staff on the Piney River, Dickson County.	Methods are the only ones available. TVA determined its use and has the expertise.	Results are presented to the TVA Board; no assurances. Field study results were used to determine the task force's recommendation.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
TEXAS				
The provisions of House Bill 2 received voter approval in November 1985. Texas Water Code Section 11.147(d) now requires the Texas Water Commission to assess the effects, if any, of the issuance of water use permits on instream uses and water quality. Implementation procedures have not yet been developed.	Texas Water Commission - Dean Robbins			
Legislation enacted that relates to instream flow includes Texas Water Code 11.147, 11.148, 11.149, 15.3041, 16.013, 16.058, 16.1331, 16.1341; Texas Parks and Wildlife Code 12.0011, 12.024.	<ol style="list-style-type: none"> 1. Texas Water Development Board, Herbert Grubb. 2. Texas Water Commission, Thomas Mason. 3. Texas Parks and Wildlife Department, Susan Rieff. <p>DWDB's role concerning instream flow activities involves long-range planning and development of state surface water resources to meet the growing demands for water supplies. TWDB also has the responsibility for conducting estuarine studies for determining freshwater inflows to maintain fisheries production in the state's estuarine systems.</p>	Collect field data for use in estuarine mathematical models to predict changes in production under different hydrological conditions. Field data normally collected continuously over a 72-hour period.	The majority of the TWDB field data are collected in estuarine systems, and the 72-hour period provides at least 2 tidal cycles for study.	No specific recommendations made yet. However, the data collected will provide water resources planners with information to maintain the ecological integrity of the estuarine systems. The TWDB's field sampling presently has limited application for determining instream flow needs and formulating recommendations.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
TEXAS (concluded)				
Parks and Wildlife Code 12.024, Water Permit. Responsibilities effective 1 Sept. 1985; Texas Water Code 11.147, Effects of Water Permits on Bays and Estuaries and Instream Uses, effective November 1985.	<ol style="list-style-type: none"> 1. Texas Parks and Wildlife Department, Resource Protection Division, Contact: Dr. L.D. McKinney. 2. Texas Water Commission, Water Rights and Uses, Contact: Jerry Boyd. 3. Texas Water Development Board, Environmental Unit, Contact: Bruce Moulton. 	IFIM.	Previous staff training and compatibility with the USFWS.	Preparation of testimony and recommendations regarding water requests before the Texas Water Commission.
UTAH				
Legislation was passed in 1986 by legislature and is awaiting signature by the Governor.	Utah Division of Water Rights will administer the flows (Contact: Robert Morgan); the Utah Division of Wildlife Resources will acquire the water right (Contact: William Geer, Director).			
Instream flow legislation was passed in 1986 and awaiting signature by the Governor.	<p>Resource Analysis Section of the UDRR administer stream flows for Utah. Contacts: Maureen Wilson and Mark Holden. Activities include review of water development projects as related to instream flow, prioritization and completion of studies and recommendation to developer of instream flow levels.</p> <p>IFIM.</p>		Comparative studies on available methods (Geer 1980), and level of protection given to a particular class of fishery.	Instream flow recommendations are based on optimum levels of habitat for species and life stages present in the stream, within limits of the hydrologic record for the stream.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
UTAH (concluded)				
Utah legislation recently passed bill but is awaiting signature by the Governor.	Utah Department of Natural Resources and Energy, Contacts: Bob Morgan - Director and State Engineer, Dee Hanson. Recommendations are made by the Utah Division of Wildlife Resources, Resources Analysis Section, Contacts: Maureen Wilson and Mark Holden.	USFWS IFG-2 and IFG-4, and Montana methods. Methods prescribed in USFS Handbook for determining channel maintenance flows.	Time, funding and importance of the fishery, and the imminence of the development.	Recommended flows in some instances have been appropriated for preservation of environment, but they have generally been less.
VERMONT				
Attempted introduction of statute in 1979 and 1980; defeated due to severe opposition from utility companies with hydro operations and even the agricultural lobby.	VT Dept. of Fish and Wildlife (Rod Wentworth) and VT Dept. of Water Resources and Environmental Engineering (Tom Willard). DWR & EE are responsible for issuing 401 Water Quality Certificates. VFWD stipulate minimum flows through the 401. F&W is party to 401 and other state and federal regulatory process. Either the F&W or the Agency of Environmental Conservation request or require minimum flows whenever appropriate.	1. VT Fisheries Needs Assessment Method (hybrid habitat flow methods similar to Waters (PGAE) method. 2. IFIM. 3. New England Aquatic Base Flow (ABF). (0.5 cfs/m Aug. median flow/1.0 cfs/m Oct. 0/4.0 cfs/m.	1. Significance of resource at stake and stream length or area affected. 2. Willingness of developer to accept USFWS ABF recommendations. 3. Complexity of habitat or flow needs issue.	Agency interpretation of usable habitat curves (identification of "best" flow for several targets, e.g., food production and one or more salmonid species in one or more life stages).

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
VIRGINIA				
Virginia's only requirement was a 401 permit was required. Proposed revisions are in progress and now under study by the State Water Control Board.	The State Water Control Board will be for the regulations proposed. The Fish and Game (W.B. Neal) will have input for flow recommendations to SWCB. We also have input through the Federal permit process.	IFIM used recently.	7Q10 basis is only engineering and not biological.	Only one instream flow study done to date (IFIM) and the results are not in yet. Within the last 4 years, no major project that would drastically reduce downstream flow has been proposed other than the one where the IFIM was used.
A 1981 Virginia Code amendment directed the SWCB to "estimate . . . the minimum instream flows necessary during drought conditions and to maintain water quality and avoid permanent damage to aquatic life." A study was conducted to evaluate this, the results of which are currently unavailable.	CFIG asserts instream flow needs for fishes (Jack Hoffman). Department of Conservation and Historic Resources, Division of Parks and Recreation asserts instream flow needs for recreation (John Heerwald). SCWB issues 401 Certificates (Larry Lawson). Complex or controversial matters are often coordinated by the Council on the Environment (Keith Buttleman).	Seldom used. Further, recreational interests are asserting instream needs for boating, canoeing, and rafting with increasing force. These assertions cannot be called field based.	Premature to state for Virginia.	Premature to address for Virginia.
Fundamental changes in the Water Code of Virginia are needed to implement any policy to protect instream flows. Currently, water rights are not administered	The VA Commission of Game and Inland Fisheries (Jack Hoffman) and the USFWS (Glenn Kinser) co-operator with federal agencies and private water developers to recommend flow regimes below dams and diversions through the	Seldom used. When they are, it is either the wetted perimeter approach or a very limited analysis (few species) using PHABSIM.		

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
<p>VIRGINIA (concluded)</p> <p>by any governmental agency but arise as a consequence of ownership of land in contact with a body of water or land overlying ground-water. Disputes over water use are resolved through lawsuits between competing parties. Conflicts are becoming more commonplace and hearings are being held. Comprehensive proposals for change have been developed (see A Water Code for Virginia Bull.).</p>				
	<p>FERC permitting process and the Fish and Wildlife Coordination Act. The VA State Water Control Board is the primary agency with responsibility for managing water quality, and hence instream flows for maintaining water quality (Richard Hill).</p>			
<p>WASHINGTON</p> <p>Minimum Water Flows and Levels Act of 1969 Chapter 90.22 RCW; Water Resources Act of 1971, Chapter 90.54 RCW.</p>				
	<p>Department of Ecology - Water Resources Planning and Management Section establishes instream flows by administrative rule (Ken Slattery); Depts. of Game and Fisheries - recommend to DOE (Dr. Hal Beecher, WDG; Duane Phinney, WDF).</p>	IFIM and Department of Fisheries USGS method.	Credibility and cost.	Field results are discussed with state fish and wildlife agencies, Indian tribes, and other interests. Their recommendations are received and considered. Optimum habitat protection flows are proposed where hydrologically reasonable. 90% of maximum habitat is used as objective as a minimum flow.

(Continued)

Appendix B. (Continued)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
WASHINGTON (concluded)				
Three different existing acts. Legislative activity each session proposing change.	Dept. of Ecology establishes flows based on recommendations from the Depts. of Game and Fisheries. DOE - Ken Slattery; Dept. of Fisheries - Gordon Zilliges and Jean Caldwell; Dept. of Game - Hal Beecher.	IFIM/PHABSIM for major projects and some basin planning. USGS toe of bank width for some basin planning and small diversions. Also use the Tennant method.	Project size (amount of diversion) relative to streamflow. More detail (IFIM) is needed for major projects.	We aim for flow that maximizes habitat for most critical life stages.
Minimum Water Flows and Levels (92.22 RCW)-1969; Water Resources Act of 1971 (90.54).	WA DOE sets the flows (Mike Hambrook or Ken Slattery). Depts. of Game and Fisheries negotiate with DOE in determining proper flows (Hal Beecher (WDG), Gordy Zilliges (WDG), and Kevin Bauersfeld).	IFIM. Toe-width.	Prefer methods that best represent habitat and biological requirements for fish. When funds and manpower available, IFIM is preferred. Toe-width is cheap and quick with hydrological and biological basis.	Use IFIM results as starting point for negotiations. We compare its results with "real world" conditions, etc.
WEST VIRGINIA				
Environmental legislation in general has met resistance. The state is pro-industry and any regulations controlling industry are not yet received.	WV Dept. of Natural Resources, Wildlife Division; they study instream flow needs to make recommendations on water resource developments (Dax Cincotta and Ray Menendez). USFWS also does instream flow studies.	IFIM, Aquatic Baseflow (ABF) and Tennant.	Money, manpower and available time, with some consideration given to available historical data and individual sites.	Results are used to develop recommendations to developers, regulatory agencies, and non-profit organizations.

(Continued)

Appendix B. (Continued)

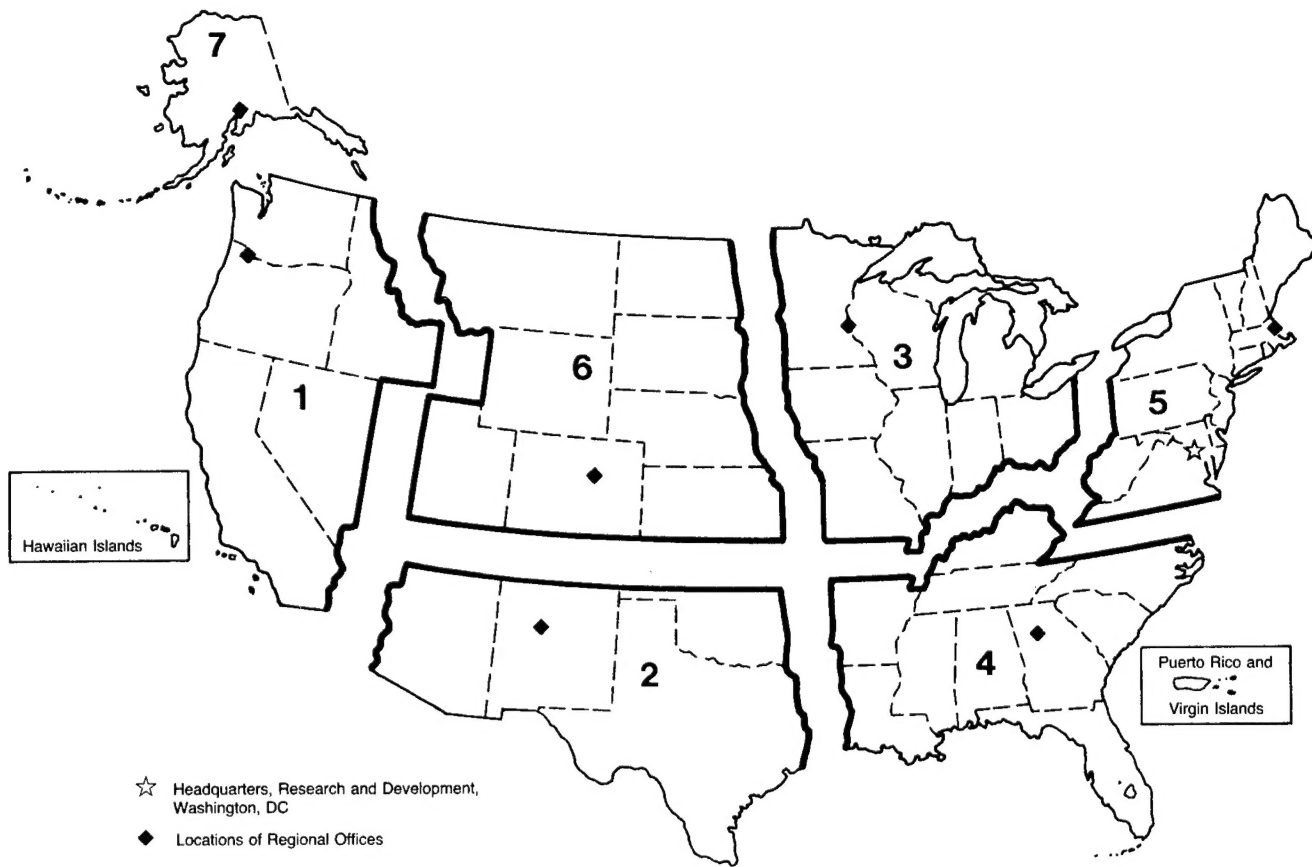
Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
WISCONSIN				
In a generic sense, Wisconsin has enacted 3 statutes that regulate flows or diversions: 31.02(1), Wisc. statute 1911; 31.34, Wisc. statute 1911; 30.18, Wisc. statute 1935. In a specific sense, no instream flow legislation has been enacted for IF needs alone. The Dept. of Natural Resources has used IFIM in the decision-making process as a tool for making	WI Dept. of Natural Resources involved in diversions, hydropower, water quality planning, reservoir planning and management. (Contacts: Dale Simon, Kate Bohmer, Bob Read, and Scott Hausann.)	All facets of IFIM, hydraulic and hydrologic modeling, computation of available habitat using Reynolds numbers, "best judgment," water quality limits, and riparian rights doctrine.	Available data base, magnitude of a project, potential for adverse impacts, statuating authority (direct vs. indirect), time available for study, money available, manpower available, priority of the project involving an IFIM study on parameters of the project, and politics of an issue, i.e., whether or not the issue can be resolved or negotiated.	Study results are used to determine the extent and magnitude of a problem, foundation for fact finding during hearing testimonies, and in cases where authority is lacking as a negotiating tool.
WYOMING				
Legislation was considered but not passed in 1985; may be considered again in 1986. Opposition by agricultural groups has been the primary cause of failure to pass the statute. An initiative to place an acceptable bill on the ballot was successful in 1984 and will appear in 1986. Support for this is unknown.	WY Game and Fish Dept. is the only state agency actively pursuing instream flows. Instream flow recommendations are based on field data. Where instream flows are to be provided as part of a water development project, they will be administered by the project sponsor.	IFG-4, a habitat maintenance procedure described by Barry Nehring and based on IFG-1 output, HQI, Tennant method.	Tennant is used only for reconnaissance level studies. The HQI, IFG-4 and IFG-1 are used in combination to determine habitat impacts (IFG-4) and maintenance flow requirements (IFG-1). Methods are selected based on the nature of potential impacts and the characteristics of the fishery that will be impacted.	All of the data used in the above methods (except Tennant) are gathered in the field. At least 3 sets of data are used for all models.

(Continued)

Appendix B. (Concluded)

Status of instream flow legislation	Which agencies administer instream flow legislation?	Field methods used	Methodology selection criteria	How are field study results used in a flow recommendation?
WYOMING (concluded)				
Initiative for 1986 General Election; one or more bills may be introduced in current legislation. None in place at this time.	Will probably be the WY Game and Fish; water use permits will be issued by the State Engineer.			State engineer will review application for adequacy of water supply and interference with other water rights, need for measuring devices, etc.

REPORT DOCUMENTATION PAGE	1. REPORT NO. Biological Report 89(2)	2.	3. Recipient's Accession No.
4. Title and Subtitle Western State Instream Flow Programs: A Comparative Assessment			5. Report Date October 1989
7. Author(s) M.J. McKinney and J.G. Taylor			6.
9. Performing Organization Name and Address National Ecology Research Center U.S. Fish and Wildlife Service Creekside One Bldg., 2627 Redwing Rd. Fort Collins, CO 80526-2899			8. Performing Organization Rept. No.
12. Sponsoring Organization Name and Address Department of the Interior U.S. Fish and Wildlife Service Research and Development Washington, DC 20240			10. Project/Task/Work Unit No.
15. Supplementary Notes			11. Contract(C) or Grant(G) No. (C) (G)
16. Abstract (Limit: 200 words) During their early history, Western States' water rights laws were primarily means for facilitating and regulating water diversions for offstream, consumptive use. More recently, a countervailing concern for instream values such as fish and wildlife habitat, recreation, aesthetic values, and water quality has emerged in the legislative and administrative handling of water rights. As of 1988, the Western United States show a variety of approaches to balancing instream and diversion water rights, from zero control through administrative actions to legislatively established rights for guaranteed instream flows. The nine Western States that have adopted statutory instream flow protection programs include Alaska, Colorado, Hawaii, Idaho, Montana, Oregon, Utah, Washington, and Wyoming. Arizona, California, and Nevada have relied, to date, on administrative and judicial decisions, while New Mexico has established no mechanism for protecting instream water uses. In the States with statutory protection, instream water uses are granted the same legal status as any other water uses under the prior appropriation doctrine. The success of instream flow protection has been remarkable, given the controversial nature of the issue, with nearly 2,000 stream reaches protected.			13. Type of Report & Period Covered 14.
17. Document Analysis a. Descriptors Fresh water Watersheds Surface waters Watercourses Water law b. Identifiers/Open-Ended Terms Instream flow, water rights, water resources, streams, rivers, water diversions c. COSATI Field/Group			
18. Availability Statement Release unlimited	19. Security Class (This Report) Unclassified	21. No. of Pages 78	
	20. Security Class (This Page) Unclassified	22. Price	



REGION 1

Regional Director
U.S. Fish and Wildlife Service
Lloyd Five Hundred Building, Suite 1692
500 N.E. Multnomah Street
Portland, Oregon 97232

REGION 2

Regional Director
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

REGION 3

Regional Director
U.S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

REGION 4

Regional Director
U.S. Fish and Wildlife Service
Richard B. Russell Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

REGION 5

Regional Director
U.S. Fish and Wildlife Service
One Gateway Center
Newton Corner, Massachusetts 02158

REGION 6

Regional Director
U.S. Fish and Wildlife Service
P.O. Box 25486
Denver Federal Center
Denver, Colorado 80225

REGION 7

Regional Director
U.S. Fish and Wildlife Service
1011 E. Tudor Road
Anchorage, Alaska 99503



Preserve Our Natural Resources



DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE



As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.